Imperial Bureau of Plant Breeding and Genetics

Plant Breeding Abstracts

Vol. XI, No. 4.

(Abstracts Nos 848—1145)

School of Agriculture
Cambridge
England

1st October, 1941.

TABLE OF CONTENTS.

		PAGE
519	Statistics* (Empire)	251
	(Foreign)	262
575	Breeding* (Empire)	252
	(Foreign)	263
575.1	Genetics*	269
576.1	Origin of Species, etc.	272
576.3	Cytology*	272
58	Botany*	273
632.4	Fungi* (Empire)	252
	(Foreign)	274
633.1	Cereals (Empire)	252
	(Foreign)	275
633.11	Wheat	276
633.13	Oats (Empire)	253
	(Foreign)	285
633.14	Rye	286
633.15	Maize	288
633.16	Barley (Empire)	253
	(Foreign)	293
633.17	Millets and Sorghum (Empire)	253
	(Foreign)	296
633.18	Rice	297
633.2	Forage Grasses (Empire)	253
	(Foreign)	299
633.3	Leguminous Forage Plants	300
633.4	Roots and Tubers (Empire)	254
	(Foreign)	302
633.5	Fibres (Empire)	255
	(Foreign)	304
633.6	Sugar Plants (Empire)	259
	(Foreign)	308
633.7	Stimulants (Empire)	260
	(Foreign)	311
633.8	Aromatic Plants	314
633.85	Oil Plants (Empire)	260
	(Foreign)	315
633.91	Rubber Plants	315
634	Fruits	315
634.3	Citrus Fruits	318
634.4	Various Small Fruits	319
634.5	Nuts	319
634.6	Palmaceous and Other Tree Fruits	260
634.7	Small Bush Fruits	320
634.8	Viticulture	323
634.9	Forestry (Empire)	261
	(Foreign)	325
635	Vegetables (Empire)	261
	(Foreign)	327
	Book Reviews	334

Note.—Initialled abstracts are written by the following:—

Dr S. Ellerton	S. E.
Dr H. O. Hartley	H. O. H.
Mrs R. M. Ingham	R. M. I.
Dr B. P. Pal	B. P. P.

* General studies, see also individual crops.

Plant Breeding Abstracts.

Vol. XI, No. 4.

Part 1. Empire Section

STATISTICS 519

848. KENDALL, M. G. 519.24

A theory of randomness.

Biometrika 1941 : **32** : 1–16.

The author gives a critical discussion of the philosophical foundations of the theory of probability. In particular he criticizes the rigidity of von Mises's conception of the irregular Kollectiv and his conception of randomness. He argues that there is no absolute randomness and that a series would be conceived as "random" relatively to certain laws of formations (called selectors). Thus, if "black" and "red" were to turn up at alternative turns of the Monte Carlo roulette, a gambler by putting on "black" at every second turn would win with certainty. Such a series of black and red would therefore not be random relatively to the selection of all odd turns. In fact, however, the "random" series produced by the Monte Carlo roulette has baffled all attempts of gamblers to find a "law" (i.e. selector) which would help them to bias the chances in their favour.

Where the experimenter relies on randomness for an unbiassed comparison of experimental treatments, etc., he is warned by the author to make sure that the way his random series has been produced precludes any bias through selection through laws of formation inherent in the biological nature of his experiment. H. O. H.

849. NEYMAN, J. 519.24

Conception of equivalence in the limit of tests and its application to certain λ- and χ^2-tests.

Ann. Math. Statist. 1940 : **11** : 477–78.

The author introduces a general conception of "equivalence" between statistical tests, with the object of replacing complicated tests for composite hypotheses by "equivalent" tests of a simpler nature. As an example for the application of the general theory a fictitious experiment is considered in which several varieties of sugar beet are tested for resistance to a certain disease in a number of randomized blocks. If for each variety and in each block the proportion of infected beet is recorded it is sometimes important to know whether the effect of a change in environmental condition is additive to any varietal effect. This hypothesis may be tested by referring to the ordinary χ^2-table the minimum value of a certain modified χ^2-statistic. To find this minimum a set of simultaneous equations has to be solved and it is very doubtful whether the arithmetical labour involved is justified by the information gained from the test. H. O. H.

850. BOSE, R. C. and KISHEN, K. 519.24:631.421

On the problem of confounding in the general symmetrical factorial design.

Sankhyā : Indian J. Statist. 1940 : **5** : 21–36.

The authors deal with certain designs in field experimentation called confounded—factorial—symmetrical designs. In such designs several factors are tried out simultaneously, but the number of levels at which each factor is applied must be the same for all factors. If for instance simultaneous application of N-, P- and K-manure is tried out (three factors) and each manure is applied at 4 different levels we have a case for a 4^3 factorial design. The authors establish a general principle of forming all possible confounded designs comprising sub-blocks with s^{m-k} plots where k may be 1, 2, . . . m-1. These designs are given in detail for experiments of the type s^3 and s^4, i.e. for designs in which 3 or 4 factors are tried out at s levels. The results are derived from the mathematical theory of Galois fields and associated finite hyperdimensional projective geometries. Similar results were recently presented by K. R. Nair who used the theory of Hyper-Graeco-Latin-Squares. In both theories s has to be a prime or a power of a prime. H. O. H.

851. KRISHNA IYER, P. V. 519.24:631.421
The analysis of incomplete split plot designs.
Sci. and Cult. 1941 : **6** : p. 487.

The split plot technique in field experiments provides for two experimental errors (*a*) and (*b*), one for the comparison of main treatments (usually differences in field cultivation) and the other for the more accurate test of subtreatments (usually manurial) and the interactions. Whilst the analysis of a *complete* split plot design follows straightforward lines of analysis of variance a difficulty arises in the separation of the two errors in an *incomplete* split plot design. Following the customary technique of fitting constants to represent treatment and block differences the author subtracts the variation between these constants from the total sum of squares to obtain as a residual the compound error (*a*) plus (*b*). To split this into its components it is sufficient to estimate error (*b*). To this end all main plots are grouped so that plots with the same main treatment are in the same group, each group being regarded as a separate hypothetical experiment. For each group the residuals are then calculated by the standard method of fitting constants and pooled to form the sum of squares of error (*b*). The degrees of freedom are split correspondingly. H. O. H.

852. NAIR, K. R. 519.24:631.421
Balanced confounded arrangements for the 5^n type of experiment.
Sankhyā : Indian J. Statist. 1940 : **5** : 57–70.

Following his recent paper on a general method of constructing confounded, factorial, symmetrical field designs the author deals here in detail with those in which all factors are tested at 5 levels. Most of the paper is concerned with experiments in which 3 or 4 factors are tested at 5 levels each.

With three factors 16 replications are required for complete balancing of partially confounded second order interaction. Each replication comprises 5 sub-blocks of 25 plots each and has 4 degrees of freedom of the second order interaction confounded. For the $16.5.25 = 2000$ plots the appropriate treatment combination is given in the form of a tabular key.

With four factors, 64 replications each containing 25 sub-blocks of 25 plots each are required for complete balancing, but 32 or 16 replications are sufficient if some of the high order interactions are left confounded. The scale of such experiments is, of course, far too big for the requirements of most experimenters. H. O. H.

BREEDING 575

853. O'CONNELL, T. 575:633(41.5)
Production of seed grain in Eire.
B.G.A. Rec. 1941 : No. 5 : 11–17.

A short account is given of the plant breeding work and of the distributing of pedigree seed in Eire. Mention is made of the production of the famous barley Spratt Archer 37/6, and of Spratt Archer 37/3 which is now propagated instead of the original 37/6.

FUNGI 632.4

854. SRINIVASAN, B. 632.422.3:575
The cytology and genetics of yeasts.
Curr. Sci. 1941 : **10** : 90–91.

A review of the genetical work of Winge and Laustsen on yeasts. It is pointed out that in addition to its theoretical interest, this work makes possible the breeding of yeasts of desired quality. More than a dozen hybrids have been produced, one of them possessing remarkable characteristics of value to the brewing industry.

CEREALS 633.1

855. HARRINGTON, J. B. 633.1:575:631.421
The effect of having rows different distances apart in rod row plot tests of wheat, oats and barley.
Sci. Agric. 1941 : **21** : 589–606.

In order to have a 4–6 replicate comparative plot test of new purified hybrids which would be practically free from competition and which could be carried out without delaying a year to increase the plant progeny rows, the author has been using single row plots with the rows

18 inches apart instead of the more usual five rows 6 inches apart or three rows 12 inches apart. The new method appeared to be sound and its soundness has been investigated in a four-year test with two highly contrasted varieties in each of the three crops, wheat, oats and barley. The results indicate that in most cases there are no significant yield interactions between varieties and row spacings. In a few cases, e.g. barley in 1938, a variety significantly outyielded the other variety at the 6-inch and 12-inch spacings but not at the 18-inch spacing.

OATS 633.13

856. HAMILTON, D. G. 633.13–2.183–1.521.6:581.44
Certain oat culm characters and their relationship to lodging.
Sci. Agric. 1941 : **21** : 646–76.

The correlations between a large number of plant characters and the degree of lodging of ten oat varieties were investigated. The oat varieties showed a range in lodging from 0% in Trelle's Dwarf to 99% in Don de Dieu and Old Island Black Eagle had about 10% lodging and Victory about 35%. The number of nodes per plant, the length of the three lower culm internodes and the length of the three lower leaf sheaths are not correlated with the degree of lodging. The combined effect of height of plant and diameter of the culm at the second above-ground internode showed a definite relation to resistance to lodging. Chemical investigations were also carried out—a high degree of lodging was found to be associated with a high percentage of lignin while percentage silica or pentosans showed no relationship to the degree of lodging. In the study of the anatomical characters of the culm it was found that the radial diameter of vascular bundles was greater in the strong strawed varieties and that the strong strawed varieties also had a larger number of vascular bundles in the parenchyma area of the culm. Many other anatomical characters of the culm were shown to be useless as possible indices of resistance to lodging.

BARLEY 633.16

857. SCOTT, R. C. 633.16:576.16
The origin of Prior barley.
J. Dep. Agric. S. Aust. 1941 : **44** : 397–98.

This is an account of the early history of Prior barley, which is generally considered to be a strain of English Archer malting barley. There is, however, no record of the variety from which Prior actually originated.

MILLETS AND SORGHUM 633.17

858. RANGASWAMI AYYANGAR, G. N. and KUNHI KORAN NAMBIAR, A. 633.174:575.11.061.6
The inheritance of the manifestation of purple colour at the pulvinar regions in the panicles of sorghum.
Curr. Sci. 1941 : **10** : 80–82.

The distribution of purple pigment in sorghum is described in detail. Deep purple in the coleoptile, a character of African origin, usually goes with purple in the auricular junction of the leaves, in the pulvini of the inflorescence and in the anthers, but rare types occur with purple auricular junction and non-purple pulvinus or with purple pulvinus and non-purple anthers.

A cross was made between two types, both having purple auricular junctions and yellow anther sacs, the pulvinus being purple in one and non-purple in the other. The F_1 had purple auricular junctions, purple pulvinus and yellow anther sacs and in F_2 and F_3 monogenic segregation was observed, with purple pulvinus dominant. The segregation for this gene was independent of that for *D* (pithy versus juicy stem).

FORAGE GRASSES 633.2

859. ENGELBERT, V. 633.21:581.481:581.163
The development of twin embryo sacs, embryos, and endosperm in *Poa Arctica* R.Br.
Canad. J. Res. 1941 : **19** : Sect. C : 135–44.

The origin and development of twin embryo sacs in *P. arctica* are described. One embryo sac develops from the innermost of a row of four macrospores with reduced chromosome numbers

and the other from an aposporous cell that originates in the nucellus near the chalaza and behind the normal archespore. Both aposporous and normal egg cells develop parthenogenetically. Pollen germination appears to activate the aposporous polar cell to form endosperm. The greatest number of seeds originate from the aposporous ($2n$) embryo but the sexual (n) embryo develops in a few cases. The occurrence of twin pairs of plants in *P. alpigena* and *P. pratensis*, one member showing matroclinic characters and the other showing aberrant characters, is discussed in relation to the development of twin embryo sacs in *P. arctica*.

860. Rangaswamy Ayyangar, G. N. and
Ponnaiya, B. W. X. 633.282:575.11
Studies in *Sorghum halepense* (Linn.) Pers—the Johnson Grass.
Proc. Indian Acad. Sci. 1941 : **13** : Sect. B : 157–62.

A brief description is given of *S. halepense* and the inheritance of some characters has been studied. Purple colour in stigmas is a simple dominant to yellow stigmas. Reduced anther filaments are a simple recessive to normal length filaments. Compactness of panicles is a monogenic recessive to the loose panicle type. Tests have shown that the triple stigma abnormality is not heritable.

861. Richharia, R. H. and
Kotwal, J. P. 633.289:576.312.35
Chromosome number in bamboo (*Dendrocalamus strictus*).
Indian J. Agric. Sci. 1940 : **10** : p. 1033.

The chromosome number was found to be $2n = 72$. B. P. P.

ROOTS AND TUBERS 633.4

862. 633.491:575(94)
Bald, J. G. 633.491:576.16
A report on agricultural features of the Australian potato industry.
Pamphl. Coun. Sci. Industr. Res. Aust. 1941 : No. 106 : Pp. 72.

Pages 38–40 of this report deal with the varieties grown in Australia and potato breeding problems are briefly considered in pages 66–71. The American variety, Katahdin, is being used in crosses to obtain types suited to New South Wales conditions. It is also mentioned that conscious or unconscious selection by growers has resulted in the production of different strains within varieties. Thus strains of Carman have been produced varying in maturity from early to late, in cropping power and in type of tuber and top growth.

863. Arnason, T. J. 633.491:581.162.51:576.354.4
Sterility in potatoes.
Canad. J. Res. 1941 : **19** : Sect. C. : 145–55.

Bud abscission, length of flowering period, percentage of good pollen, meiosis and seed production were investigated in the three male-sterile potato varieties, U.S.D.A. 46000, U.S.D.A. 44488 (Sebago) and Early Ohio, and the five highly pollen-fertile varieties, U.S.D.A. selections 46422 and 45075 (Earlaine) and Minnesota selections 11–1–2–1, 82–11 and 75–5. Early Ohio and U.S.D.A. 46000 produced no pollen in the four years 1937–40 but U.S.D.A. 44488 formed a very small amount in three of these years. The five pollen-fertile varieties produced varying percentages of good pollen, the percentage varying with the year and also at different times in the same season. The soundness of pollen of four of these varieties was also proved by successful crosses. The first meiotic division was fairly regular in both types. The pollen-fertile varieties also had a regular second meiotic division but meiosis in the pollen-sterile varieties began to deviate from the normal development at the end of the first division. In U.S.D.A. 44488 the two nuclei formed at the end of first division often fuse again at second metaphase. Irregular spindles were also observed. In U.S.D.A. 46000 the two nuclei become somewhat pycnotic and shrink in size after first telophase. Second divisions do not usually occur. In Minnesota 82–11 it is suggested that abortion of microspores due to slight structural or physiological defects in parts of the anthers produces the 50% of bad pollen formed. All three of the male-sterile lines were capable of forming seeds when pollinated with good pollen. The pollen fertility of ten seedlings from the cross U.S.D.A. 46000 x Minesota 11–1–2–1 was investigated. Only three of these failed to produce pollen and another three produced abundant pollen.

864. Black, W. 633.491–2.411.4–1.521.6:575
Science has answer to potato blight. Immune varieties—in due course.
Fmg News 1941 : **93** : No. 28 : 5, 14.
A popular account of breeding for blight resistance in potatoes. Using *Solanum demissum* as the blight resistant parent it has been possible by repeated back-crossing with cultivated varieties to obtain in the 6th and 7th generations resistant selections which compare favourably with cultivated varieties. About 40% of the progeny in later generations are blight immune. Only one strain of blight has so far been found in Scotland.

865. Hawkes, J. G. and Howard, H. W. 633.491–2.411.4–1.521.6:575.127.2
Salaman's culture of blight resistant "Aya papa".
Nature, Lond. 1941 : **148** : p. 25.
A culture which Salaman carried under the name "Aya papa", which is immune from blight (*Phytophthora infestans*) and which is reported to come from Ecuador, provides an apparent exception to the rule that blight resistance is not found outside Mexico (cf. "Plant Breeding Abstracts", Vol. XI, 408).
Knappe's original collection of Aya papa has been found by other workers to be susceptible to blight. Salaman's "Aya papa" has been shown by the authors to be pentaploid (2n = 60–62) and to have certain similarities to *S. demissum*. They therefore suggest that Salaman's "Aya papa" is not the Aya papa of Ecuador but a hybrid between *S. demissum* (2*n* = 72) and *S. tuberosum* (2*n* = 48).

FIBRES 633.5

866. Ansari, M. A. A. 633.51(55)
Indigenous and exotic cottons of Iran.
Indian J. Agric. Sci. 1940 : **10** : 522–33.
A survey of cotton in Iran showed that the indigenous cottons belong to *G. herbaceum* var. *typicum*; a number of forms intermediate between vars. *typicum* and *frutescens* were however also found. Egyptian cotton (*G. barbadense*) is cultivated along the Persian Gulf coast. American cottons are extensively grown in Western Iran while in the rest of the country effort is being made to replace indigenous cottons by American types and the latter now form an important component of the cotton crop all over Iran.
The indigenous cottons exhibit great variability in ginning percentage, lint length and lint fineness; the *hirsutum* cottons on the other hand show much less variation. B. P. P.

633.51:575(41)
867. **Progress reports from experiment stations. Season 1939–1940. Programmes of experiments. Season 1940–1941.**
Emp. Cott. Gr. Corp. Lond. 1941 : Pp. 176.
The progress reports from Experiment Stations for the previous season (1938–39) were abstracted in "Plant Breeding Abstracts", Vol. X, Abst. 621. There is no report for the Anglo-Egyptian Sudan for the 1939–40 season. The present report contains the following papers:

Wells, W. G. — *Queensland. Cotton Research Station, Biloela. Progress Report for the season 1939–40. (pp. 1–9).*

The programme for the production of a jassid-resistant cotton has proceeded with promising results. Three selected Miller progenies showed very satisfactory uniformity of resistance and plant type. Plants of the New Boykin variety, selected in the previous season as jassid-resistant, however, showed no signs of resistance in the current season. Jassid-resistance seems to be inherited as an almost complete dominant in the first generation hybrids between Miller and U.4.

Macdonald, D.
Fielding, W. L. and
Ruston, D. F. — *South Africa. Cotton Experiment Station Barberton. Cotton breeding and field experiments. (pp. 12–14).*

Rose, M. F. — *South Africa. Rotation crops. (pp. 27–31).*

The striking yield increases of the 5143 re-selections over their parent found in 1938–39 were not fully maintained this season at Barberton, where there were very good growth conditions,

but in Swaziland, where conditions were not so good, the superiority of the re-selections over the parent was maintained. Re-selections from the 921 family gave very significant increases in yield over 5143 and have a high ginning percentage (three of them gave an average of 40·3%). Strains selected and directly descended from U.4 were found to outyield U.4 bulk in a "progress" trial. Crosses are also being made to obtain greater hairiness on good U.4 types. MV.8A (an Indian Upland type), which is a very hairy *hirsutum,* is being used in this work.

The breeding for streak resistance in maize has been continued.

Cameron, G. S. — *Southern Rhodesia. Cotton station, Gatooma. Progress Report for the season 1939–40.* (*pp. 65–71*).

The strain 7L.1 continues to give very satisfactory yields with high ginning percentages. Further single plant selections have been made. The effect of colchicine treatment has been investigated.

Nye, G. W. and Jameson, J. D. — *Uganda. Cotton Experiment Stations, Kawanda and Serere, Progress Reports for the season 1939–40.* (*pp. 75–87*).

At Kawanda a selection made in the F_1 generation back-cross B.181 x (B.181 x B.P.52) appears to be superior to any of the pedigree lines when judged on a combination of the four characters—lint length, ginning percentage, resistance to blackarm and resistance to wilt. There were selection plots and variety trials at Serere.

Peat, J. E., Prentice, A. N. and McKinstry, A. H. — *Tanganyika Territory. Ukiriguru Experiment Station and Farm, and Mwabagole Rice Station. Progress Report for the season, 1939–40.* (*pp. 90–98*). *Lubaga Experiment Station, Shinyanga. Progress Report, 1939–40.* (*pp. 100–108*). *Kingolwira Extension Farm. Progress Report for the season 1939–40.* (*pp. 109–15*).

At Ukiriguru strain 561 and two selections from it gave fairly good performances. Among the best varieties are the U.4 lots, especially those with a high degree of jassid-resistance. Selections, all jassid-resistant, have been made from the Mwanza strains, from "Local" and from the U.4 lots. At Lubaga jassid attack was intense and prolonged. Some Gatooma U.4 x Cambodia back-crosses and a Gatooma U.47L.6, and its derivatives were very resistant to this attack. Selections for jassid-resistance were continued. Breeding for jassid-resistance is also carried out at the Kingolwira Extension Farm.

Ducker, H. C., Miller, W. L. and Hoyle, S. T. — *Nyasaland. Cotton Experiment Stations, Progress Report for the season 1939–40.* (*pp. 117–24*).

Trials of strains were continued. It was again confirmed that the U.4 x Cambodia x U.4 is the highest yielder at the Domira Bay Station. The breeding work was mainly confined to the continued sorting out of U.4 stocks and some of the crosses which have been longest in cultivation. The only U.4 material with sufficiently good quality is 920 and possibly C.28. Harland's U.4 x Gambia x U.4 produces a very large number of small bolls, a character which may be of value in combating certain pests. The local cross, S.G. 27 x Over the Top B.30.1, has probably the best quality lint of any cotton on the Station and also yielded well this year.

Hutchinson, J. B., Silow, R. A. and Stephens, S. G. — *West Indies. Trinidad Cotton Research Station, Genetics Department. Progress Report for the period October, 1939–October, 1940.* (*pp. 152–57*).

The genetics research has been continued. Harland's conclusion that there are different normal alleles of crinkled distinguishable by differences in dominance potency has been supported in part. Important environmental effects on dominance have been demonstrated from experiments with Meade x Meade crinkled. The following abnormalities are now known to be independent of the crinkle series—round leaf, glabrous dwarf, Nigerian rogue, St Joseph crinkled, Columbian rogue and Moco short bract. An abnormal mutant sector, the flowers of which were female sterile and produced very little pollen was found in Dr Mason's Sea Island material. The distribution of the corky gene carried by Bourbons has been investigated by crossing a series of Bourbons with Sea Island V.135.

In its main features the experiment with leaf shape is now complete. Results indicate that there are only four main leaf genes in New World ($2n = 52$) cottons.

Much of the season was devoted to the study of the quantitative effects of certain genes affecting lint density. These genes had been originally identified and isolated by means of their effect on the "Wagale" lintless mutation. It was found that the two minor genes (lintless modifiers) are of approximately equal potency and that the interaction between these genes at different loci is of low degree and strictly comparable with that which occurs between pairs of these alleles at the same locus. Their effects at the higher levels of expression covered by the H_a h_a phase of the main genes are also considerably less than in the lower range covered by the h_a h_a phase. All these findings are in accordance with the interaction hypothesis of quantitative inheritance and with its extension to cover dominance (see "Plant Breeding Abstracts", Vol. IX, Abst. 1311).

Tetraploid *G. arboreum* ($n = 26$) and hexaploid *barbadense* x *Raimondii* ($n = 39$) have been obtained by colchicine treatment and are being used in interspecific hybridizations. The genetic structure of the wild species *G. anomalum* has been compared with that of the cultivated Asiatic species *arboreum* and *herbaceum*. The results indicate that *anomalum* is much further removed from the two cultivated species than these are from one another and that such types as *anomalum* are not likely to be of any value as a source of lint length or ginning out-turn genes.

Grafting experiments have shown some unsuspected effects of stock on scion. The effects of scion on stock were also investigated and it was shown that the root size of a stock was almost entirely governed by the type of scion grafted upon it.

Manning, H. L. — *West Indies Cotton Experiment Station, St. Vincent. Progress Report for the season 1939–40, and Programme of Experiments for the season 1940–41. (pp. 161–73).*

The main breeding trial consists of an annual experiment to maintain and improve the V.135 strain. VH hybrids (V.135 x Montserrat Sea Island) were also included in the experiment this year. In general the VH progenies showed only small differences from those of V.135. The genetics of the semi-sterile mutant of V.135 and of fuzzed V.135 were also investigated.

Surridge, H. R. — *Fiji. General Experimental Station, Sigatoka, Cotton Progress Report for the season 1939–40. (pp. 174–76).*

Single plant selections and progeny tests of Sea Island cottons were continued.

868. 633.51:575(54)

Indian Central Cotton Committee.

Curr. Sci. 1941 : **10** : p. 93.

According to this brief report of the Second Conference of Scientific Research Workers on Cotton, held in Bombay, 19–21 January, 1941, cotton breeding figured largely in the discussions. The need for a complete survey of cottons in Eastern Bengal, Assam and Burma and for a more intensive programme of hybridization was urged. Interest was shown in the Asiatic-American crosses being studied at Surat. The view was expressed that a very prolific, very short-stapled cotton would under present conditions command a limited market. The Technological Laboratory has advanced the percentage of the variation in spinning performance which can be accounted for in terms of fibre properties from 86% to 89% by taking into account fibre length, fibre weight per inch and swollen hair diameter.

The problem of breeding a completely wilt-resistant cotton was discussed. Encouraging results from a technique worked out at Poona were reported and the desirability of co-operation between different specialists was emphasized.

869. Sethi, B. L. 633.51:575(54.3)

A note on the cultivation of improved varieties of cotton in the United Provinces.

Bull. Dep. Agric. Unit. Prov. 1941 : No. 84 : Pp. 5.

Accounts are given of the two improved cotton varieties, C.520 and Perso-American, which have been produced by the Department. C.520 (*G. arboreum*) was extracted from the indigenous cottons of Saharanpur. It is characterized by early maturity, hardiness to withstand adverse weather conditions and high yielding capacity. It has a ginning out-turn of

38% and a staple length of 11/16 to 13/16 inch. Perso-American (*G. hirsutum*) is a selection from American types imported from Persia by the Department. In quality the variety is definitely superior to C.520 and it yields at least as much as C.520. It has a ginning out-turn of 32% and a staple length of 28/32 inch.

870. 633.51:575.1

Report of the Administrative Council of the Corporation submitted to the Twentieth Annual General Meeting on May 27th, 1941.

Annu. Rep. Emp. Cott. Gr. Corp. 1939–40 (1941) : Pp. 34.

In the section on research a very brief account is given of the work of the Genetics Department of the Society's Research Station at Trinidad. The conclusion has been reached that the cottons of the Sea Island group are rather poorly protected against the deleterious effects of hereditary disturbances of leaf development.

The number of genes affecting the quantity of lint per seed is large and though it has been found that the law of diminishing returns applies to their effect, it is believed that there is still room for considerable increases.

Fertile hybrids between Sea Island cotton and the Peruvian species *Gossypium Raimondii* have been obtained with the aid of colchicine treatment and several *Raimondii* characters have been transferred to types similar to Sea Island.

871. GOVANDE, G. K. 633.51:575.116.1

Linkage relations of the white-pollen factor in Asiatic cottons.

Indian J. Agric. Sci. 1940 : **10** : 842–43.

Crosses between Cocanada 45, a strain with white pollen, and other Asiatic cottons showed that the white pollen character was linked with presence of leaf nectaries. No linkage was found between the former character and leaf shape, lint colour, petal colour and presence of anthocyanin pigment. B. P. P.

872. SILOW, R. A. 633.51:575.127.2:575.11

The comparative genetics of *Gossypium anomalum* and the cultivated Asiatic cottons.

J. Genet. 1941 : **42** : 259–358.

Hybrids between the cultivated Asiatic diploid cottons, *G. arboreum* and *herbaceum*, are fully fertile in the F_1 and only show breakdown in viability and fertility in the F_2. F_1 hybrids between the two cultivated species and the wild diploid African cotton, *G. anomalum*, are almost completely sterile but by back-crossing the hybrids to *G. arboreum* and *herbaceum* it was possible to obtain fertile lines which had one or more *anomalum* characters. It was the genetics of such lines which were studied in the present work and the inheritance of eight characters—corolla colour, anthocyanin production, pollen colour, the presence or absence of various types of nectaries, the type of seed fuzz, lint colour, the semi-lethal or lethal type of abnormality known as "crumpled" and leaf shape—was examined. It was found that the same main loci are represented in all three species, but that different alleles may enter into the construction of homologous characters. Thus in the cultivated Asiatic cottons the types of anthocyanin petal spot are determined by a single allele while in *G. anomalum* they are the result of genes, situated in duplicate loci, which act as "complementaries". The genetic results also suggest that the diploid species are derived polyploids (for cytological evidence, see "Plant Breeding Abstracts", Vol. VII, Abst. 1123). *G. arboreum* and *herbaceum*, which are closely related species, were found to differ only slightly in their main loci but to have quite distinct modifier systems. *G. anomalum*, which is taxonomically very different from the two cultivated species, shows also a wide divergence in its main loci from *arboreum* and *herbaceum* and also has a modifier system which is quite distinct from those of the two cultivated species.

873. AHMAD, N. 633.51:581.6(54)

Technological Reports on trade varieties of Indian cottons, 1940.

Technol. Bull. Indian Cott. Comm. 1940 : Series A, No. 51 : Pp. 107.

AHMAD, N.

Technological Reports on standard Indian cottons, 1940.

Ibid. 1940 : Series A, No. 52 : Pp. 110.

In the first of these two bulletins (Series A, No. 51) accounts are given of the technological properties of 22 cottons supplied by the East Indian Cotton Association, 12 supplied by the

Bombay Millowners' Association and 3 supplied by the Ahmedabad Millowners' Association. In the second bulletin (Series A, No. 52), in addition to the technological reports details are given of the history, district of growth, growing period, soil and climatic conditions under which grown, plant particulars, yield of seed-cotton and area under cultivation for each variety. There are described 21 standard Indian cotton varieties—Jayawant (Kumpta), Gadag 1 (Dharwar-American), Surat 1027 A.L.F., Wagad 8 (Dholleras), Sind-Sudhar, Sind-N.R., Punjab-American 4F, L.S.S., Punjab-American 289F, Mollisoni (Bengals), Aligarh A.19 (Bengals), C.402 (U.P.), Verum 262 (Unagpur) and (Akola), V.434 (Akola), Late Verum (Nagpur), Umri Bani, Cambodia Co. 2 (Cambodia 440), Nandyal 14 (Northerns), Hagari 1 (Westerns), Karunganni C7 and Koilpatti 1.

874. Koshal, R. S.,
Gulati, A. N. and
Ahmad, N. 633.51:581.6:575.11
The inheritance of mean fibre-length, fibre-weight per unit length and fibre-maturity of cotton.
Indian J. Agric. Sci. 1940 : **10** : 975–89.

In this study of three cotton strains and their F_1s, grown in a randomized block experiment, it was found that the major portion of the observed variation was due to varieties and was genetical in nature. For fibre weight per unit length, the effect of epistasy and heterosis was non-significant; in the case of the other two characters, however, heterosis was found to be significant, especially in the case of fibre length.

A positive significant correlation was found between fibre-maturity and fibre-weight and a negative significant correlation between fibre-length and fibre-weight per unit length. The latter correlation was however insignificant for plants within the same plot. B. P. P.

875. Verma, P. M. and
Afzal, M. 633.51–2.7–1.521.6
Studies on the cotton jassid (*Empoasca devastans* Distant) in the Punjab. 1. Varietal susceptibility and development of the pest on different varieties of cotton.
Indian J. Agric. Sci. 1940 : **10** : 911–26.

While the indigenous cottons are practically immune from the pest, the varieties of American cotton are usually severely attacked. Of the American varieties studied LSS was found to be the most resistant and 289 F K25 the most susceptible; the other varieties were intermediate between these in resistance. B. P. P.

876. 633.52:575(41.5)
New pure strains of flax.
Leafl. Min. Agric. N. Ire. 1939 : No. 74 : Pp. 9.

The first part of this leaflet gives a short account of the history of flax breeding in Northern Ireland. The results of flax variety trials in the nine seasons, 1930 to 1938, are then given. Finally there are short descriptions of the following varieties:—Stormont Gossamer, Stormont Cirrus, Liral Crown, Liral Monarch, Liral Dominion, Liral Prince and J.W.S.

877. Lock, G. W. 633.526.23.00.14(67.8)
Report of the Sisal Experimental Station, Mlingano, for the year 1939.
Pamphl. Dep. Agric. Tanganyika 1941 : No. 26 : Pp. 21.

The material of interest to plant breeders in this report is similar to that found in the report for the year 1938 (see "Plant Breeding Abstracts", Vol. X, Abst. 293).

SUGAR PLANTS 633.6

878. S . . ., S. O. 633.61–2.7–1.521.6
Resistance of new seedlings to Frenchi grub attack.
Cane Gr. Quart. Bull. 1941 : **8** : 142–43.

The sugar cane varieties Q.28, Jason and Comus were able to withstand the combined effects of heavy grub attack and unfavourable conditions while the varieties 1900 Seedling and Q.20 were almost wiped out.

STIMULANTS 633.7

879. MacRae, N. A. 633.71:575.127.2:575.11

Genetic analysis of *Nicotiana triplex* segregation products and their relationship to existing *N. tabacum* types.

Tech. Bull. Dep. Agric. Can. 1941 : No. 33 : Pp. 36.

Nicotiana triplex was obtained by pollinating the F_1 hybrid *N. Tabacum* x *N. tomentosiformis* with *N. silvestris*. *N. triplex* originated from an unreduced gamete produced by the F_1 and a normal reduced one from *silvestris* and therefore has the genom constitution of *Tabacum-tomentosiformis-silvestris*. The trigenomatic plants are highly fertile (*Tabacum* is an allotetraploid whose parent species may be *tomentosiformis* and *silvestris*). *N. triplex* selections were obtained as a result of continued selfing and the genetics of these selections were studied. Two pairs of factors were found for flower colour, *Wh* v. *wh* for pink v. white flowers and *Pk* converting pink into carmine. White throat and pale filaments of carmine-coloured flowers was due to a third recessive factor. The genetics of the different leaf shapes were studied and the following genetical constitutions are suggested: *BrBrPtPt*, lanceolate, *BrBrptpt*, broad; *brbrPtPt*, petiolate and *brbrptpt*, constricted. A third factor *Wp* is necessary to account for the semi-broad or short-winged petiolate type and the long-winged petiolate type is due to a fourth factor, *Pw*. The factors *Br* and *Pk* are very closely linked. It is also pointed out that the *N. triplex* selections do not differ extensively from previously existing *N. Tabacum* types.

880. Knapp, A. W. and Hearne, J. F. 633.74:575.061.6

The presence of leuco-anthocyanins in Criollo cacao.

Analyst 1939 : **64** : 475–80.

Evidence is presented to show that the different parts of the bean and pod of pure Criollo cacao contain a colourless precursor of cyanidin, the anthocyanin pigment of Forastero cacao. It is suggested that the relative amounts of leuco-anthocyanin and anthocyanin might give an indication of the parentage of hybrid forms.

881. 633.74–2.8–1.521.6

Swollen-shoot disease of cacao.

Trop. Agriculture, Trin. 1941 : **18** : p. 86.

It is mentioned that at some farms in the Gold Coast where the cacao trees have been killed by the swollen-shoot virus disease one or two trees have remained healthy. It is hoped that these will prove to be immune or highly resistant.

OIL PLANTS 633.85

882. Webster, C. C. 633.854.56:575(68.9)

Notes on the progress of tung experimental work. The selection and yield recording of promising trees.

Nyasald Agric. Quart. J. 1941 : **1** : No. 2 : 16–18.

Only a small amount of selection has so far been carried out because the experimental tung plantations mostly consist of trees less than five years old.

883. Webster, C. C. 633.854.56:575.127.2

A note on the possible production of hybrid seed by natural cross pollination between *Aleurites Fordii* and *A. montana*.

Nyasald Agric. Quart. J. 1941 : **1** : No. 2 : 14–15.

Plants which are intermediate between *A. Fordii* and *A. montana* have been observed both in nurseries and in the field. These plants have always been found in fields established from seed which came from mixed plantations of the two species and it appears probable that such plants are hybrids produced by natural cross pollination. If these plants are hybrids, some of them might combine the higher yield of *A. montana* with a quality of oil equal to that of *A. Fordii*.

PALMACEOUS AND OTHER TREE FRUITS 634.6

884. 634.61:575(54.8)

Report and accounts of the Coconut Research Scheme for 1940.

Sess. Paper Coconut Res. Sch., Ceylon 1941 : No. XVI : Pp. 18.

Field recording and studies on high yielding palms have been continued (cf. "Plant Breeding Abstracts", Vol. X, Abst. 59).

FORESTRY 634.9

885. 634.972.1:575.127.2
634.775.4:575.127.2

PARKER, R. N.

Two natural hybrids.

Indian Forester 1939 : **65** : 585–86.

A natural hybrid between *Quercus dilatata* Lindl. and *Q. incana* was found by the roadside. Some seedlings from this hybrid tree resembled one parent in the shape of their leaves and the other parent in the leaves being white tomentose on the lower side. Hybrids between *Opuntia dillenii* Haw. and *O. stricta* Haw. also probably occur in Nurpur, Kangra.

VEGETABLES 635

886. 635:575(54.8)

Objectives in vegetable breeding.

Trop. Agriculturist 1940 : **95** : 344–49.

In order to help the Botanist in fixing standards to be aimed at in vegetable breeding, there were circulated among members of the various Agricultural Committees and among Agricultural Instructors of the Department in Ceylon copies of a questionnaire asking their opinions on the marketing of vegetables, on the importance of quality, size, uniformity, keeping quality, age of maturity, habit and disease resistance in vegetables and also on the importance of particular points in certain individual vegetable crops. Sixty to eighty replies were obtained to most questions. Probably the most striking feature of the replies is the insistence on quantity rather than quality.

887. BUTLER, L. 635.64:575–181:581.47

The inheritance of fruit size in the tomato.

Canad. J. Res. 1941 : **19** : Sect. C. 216–24.

It has been previously shown (see "Plant Breeding Abstracts", Vol. VII, Abst. 1649) that in tomatoes fruit size in the F_1 is close to the geometrical mean of the two parental sizes and that the F_2 frequency distributions of the fruit weights in crosses are strongly skewed. It is shown in this paper that, when the logarithms of the weights are plotted instead of the weights themselves, the F_2 frequency curves become normal. It was also found that the distribution of ovary sizes at anthesis in F_2 is strongly skew in a positive direction but becomes normal when plotted on logarithmic paper. In most of the crosses the parental ovary sizes are recovered in the F_2. This indicates that ovary size is controlled by few factors and in one cross, Red Currant x 902 selection, it is calculated that the large-sized fruit parent differs from the small sized fruit parent in three pairs of genes. F_1 data indicate that the size of cells of the locule wall are also controlled by a geometric type of gene action. In the discussion the author raises several objections to the simple additive scheme for explaining the inheritance of quantitative characters. He points out that, if linear measurements are studied and found to fit the arithmetic mean, then it is impossible for weight, volume or area to fit the same arithmetic scheme since they depend upon a power of the linear measurements.

888. 635.64–2.484–1.521.6:575

Tomato leaf mould.

Adv. Leafl. Minist. Agric. Fish., Lond. 1941 : No. 263 : Pp. 4.

The work of the Experimental and Research Station, Cheshunt, Herts., on breeding tomatoes resistant to leaf mould (*Cladosporium fulvum*) is briefly mentioned. The comparatively resistant varieties Up-to-Date and Stirling Castle have been used as parents. A strain called Leaf Mould Resister No. 1 has proved useful in tests in commercial nurseries and other highly resistant or immune types are being tested.

889. KADAM, B. S.,
PATEL, S. M. and
PATANKAR, V. K. 635.657:581.46:575.11.061.6

Two new genes for corolla colour in *Cicer Arietinum* L.

Curr. Sci. 1941 : **10** : 78–79.

A type of gram with salmon coloured petals was crossed with a type having pink petals. The F_1 was pink and in F_2 a ratio of 3 pink: 1 salmon was obtained. Crossing with a white-grained, white-flowered type gave a pink F_1 and F_2 of 9 pink: 3 salmon: 4 white. The gene producing salmon is designated *Sa.*

A type with light purplish petals and dark purple veins was crossed with a white-flowered, yellow-grained type. The F_1 was purple veined and a 3 : 1 ratio was obtained in F_2. The gene producing purple-veined flowers is designated *Pu.*

Part II. Foreign.

STATISTICS 519

890. Papadakis, J. S. 519.24:631.421
Comparaison de différentes méthodes d'expérimentation phytotechnique. **(Comparison of different methods of experimentation in applied botany).**
Rev. Argent. Agron. 1940 : **7** : 297–363.

The author develops a new method of comparing the efficiency of field designs. The comparative effectiveness of different methods of local control depends on the fertility trends in the experimental site. Thus, in the case of two definite trends (lengthways and across the field) a Latin Square will be more effective than a randomized blocks method whilst for "patchiness" the randomized blocks will often achieve better local control.

With the author's methods fertility trends are classified by certain characteristic values which could be obtained from the yields of a uniformity trial on the site. These characteristics are: r_k the correlation between (yields of) plots in the same blockc ontaining k plots, r_l and r_c the respective correlations between plots in the same row or column, r_1 the correlation between neighbouring plots and r_2 the correlation between plots in the same row or column but separated by one plot. The experimental errors in various designs such as randomized blocks, factorial designs (with two and three factors) incomplete randomized blocks of various types are expressed in terms of the above characteristics.

The idea is an extension of the conception of R. A. Fisher's intracorrelation and the author has developed a new technique of local control which makes use of the above correlations r_1 and r_2. In the simplest case the idea is roughly to use every second experimental plot, called test plot (témoin), to construct a fertility distribution of the experimental site and then to correct the remainder of the plots, the "non-témoins", for local fertility. To this end deviations from respective treatment means are taken for all test plots and the correction to each non-témoin yield is then given by the mean deviation in the two adjacent test plots. The resulting error of the corrected yields depends on the correlation r_1 and r_2.

For certain fertility trends the author's method is more efficient than standard designs and the author is able to demonstrate this with the help of data obtained in a uniformity trial in the Punjab (cf. "Plant Breeding Abstracts", Vol. IX, Abst. 23). These data are also used as an example for the calculations of the experimental error by the new method.

One difficulty about the new method is that corrections applied to the yields of two neighbouring "non-témoin" plots are not independent, moreover treatment mean square and error mean square are not orthogonal. Standard tests of significance are therefore not applicable. The author does not consider the question of significance. If the appropriate test can be evolved at all it would certainly be complicated. H. O. H.

891. Tharp, W. H.,
Wadleigh, C. H. and
Barker, H. D. 519.24:631.421
Some problems in handling and interpreting plant disease data in complex factorial designs.
Phytopathology 1941 : **31** : 26–48.

Data on the incidence of plant diseases are often expressed as percentages (such as the percentage of plants affected) and are therefore liable to follow distribution laws which differ from the normal curve. The authors have encountered this difficulty in an experiment designed factorially to study N-, P-, K- nutrition of three varieties (Cook 307, Rowden 2088 and Half and Half) of cotton in relation to their comparative resistance to Fusarium wilt in sand culture in a greenhouse. Two difficulties arise. Firstly there is heterogeneity in the variance since a susceptible variety (like Half and Half) will show considerable variation in wilt incidence under different nutritional conditions whilst the variety Cook 307 (considered wilt resistant) will show little variation. Secondly the recorded data will not be normally distributed. This latter difficulty is usually overcome by a transformation of the data prior to the analysis of variance. The customary transformations are applied to the data but only the logarithmic one diminishes the heterogeneity of variance significantly. Moreover, the study of interactions on "the logarithmic scale" has a practical meaning

whilst interactions are only of academic interest where angular and square root transformation are used.

As an alternative to transformations, the author discusses methods of splitting the heterogeneous variance into homogeneous components. With an analysis of this kind, each treatment effect is tested against its own experimental error, so that there is some loss of experimental accuracy.

Two important aspects have been ignored. One is the possibility of modifying the test to account for heterogeneity and non-normality. Secondly, no precautions have been taken to safeguard against biassed significance through selection. With as many as 29 interactions set out in table 4 of the paper one would expect that one or two in the sample of mean squares will exceed the 5% point of significance, even if none of the interactions is real. H. O. H.

892. Cochran, W. G. 519.24:631.421:633.11

Lattice designs for wheat variety trials.

J. Amer. Soc. Agron. 1941 : **33** : 351–60.

Lattice designs (called pseudo-factorial or quasifactorial designs in the earlier papers on the subject) are used for comparing a large number of varieties. In lattice designs the block size is reduced by using blocks that do not contain all the varieties. Another method of comparing a large number of varieties is to divide the varieties into groups, inserting one or more control varieties in each group, the groups being laid out in separate randomized blocks or Latin square experiments. In this type of experimental design a pair of varieties either always appear in the same group or never in the same group. Lattice designs are constructed to avoid this. The author then discusses the lattice design with respect to field operations, number of varieties and replications, statistical analysis, nature of the adjustments, missing plots and varieties, relative accuracy of comparisons between varieties and comparison of results from different years or different centres. Next the relative accuracy of randomized blocks and lattice designs with the same number of replications is considered. Of six experiments with wheat carried out by Dr L. R. Waldron, the number of varieties ranging from 49 to 169, two showed no gain, one a negligible gain while the others showed gains of 39, 45 and 156% in efficiency relative to randomized blocks. Finally the author briefly considers other lattice designs.

893. Crist, J. W. 519.241.1

Correlation from ranks, for horticultural research.

Proc. Amer. Soc. Hort. Sci. 1941 : **38** : 593–95.

The use of Pearson's formula for rank correlation is illustrated by examples.

BREEDING 575

894. Bettoney, S. 575:576.356.5:581.04

Colchicine to aid the plant breeder.

Missouri Bot. Gard. Bull. 1940 : **28** : 119–20.

A popular account of the use of colchicine for chromosome doubling.

895. Weiss, M. G. 575:578.08

Nursery planter.

J. Amer. Soc. Agron. 1941 : **33** : 472–74.

An endless-belt nursery planter, which has proved very useful for planting field trials of cereals, soya beans and peas, is described. The planter was constructed at an approximate cost of $60.

896. 575:633(47)

(Conference on breeding and seed production in the South-East).

Socialistic Grain Farming, Saratov 1941 : No. 1 : 184–211.

The report of the conference, which took place at Saratov on 25 June-2 July, 1940, contains the following papers:—

Šekhurdin, A. P. (*Results of work on breeding and seed production in spring wheat at the Institute of Grain Crops for the S.E. U.S.S.R.*). (*pp. 184–94*).

The history of wheat breeding at Saratov is briefly outlined. Among the outstanding products of individual plant selection are Lutescens 062 (from the local Poltavka) and Erythrospermum 341 (from the local Rusak); the former has exceeded its parent in yield over the

last 23 years by an average of 3·0 c. per ha. and the latter by 2·1 c. per ha. over 19 years. The difference was more marked in drought years than in normal years.
Interspecific crossing was started in 1938 and led to the production of such outstanding wheats as Sarrubra, Sarrosa, Erythrospermum 82/02 and 78/01, which are free from shedding as well as excellent in yield and quality. By the same means awnless forms of *Triticum durum* have been produced and have given very satisfactory yields; one of the most successful was Candicans 75/09.
By crossing geographically distant forms of *T. vulgare*, e.g. variety *graecum* from Turkestan with variety *lutescens* an improved form Lutescens 53/12 was produced; this form excelled 062 in yield, 1000 corn weight, quality and drought resistance.
The wheats produced by breeding were further improved by crossing them among themselves and with imported varieties, by which means it has been possible to produce such varieties as Albidum C–43, which comes into ear 4–6 days earlier than Lutescens 062 and yields very heavily. Others are resistant to smut and brown rust and have outyielded all other forms in bad rust years; one of them, Lutescens C–758, is also very strong in the straw; it is being further crossed to improve the yield and size of grain.
The breeding work is speeded up by growing promising material over the winter in electrically equipped greenhouses and in the later stages by testing in a number of different regions.

Rževskii, I. S. (*Breeding winter wheat at the Čakino breeding station from 1931 to 1939*). (*pp. 194–200*).

The limiting factor in winter wheat cultivation in the Tambov area is winter-hardiness and observations have been made on a number of varieties, of which the best have proved to be the local populations from various parts of the U.S.S.R. and certain other countries. From these, selections have been made and have yielded up to 20% more than the local standard. Some of the new hybrids have yielded from 22·6 to 41·5% more than the standard, their superiority being especially evident in drought years; this was particularly true of the hybrid Barbarossa G.1480. The hybrids had longer grain than the standard and were superior in baking quality.
Data are given regarding the winter-hardiness of the new varieties; further crossing is being undertaken to improve this feature.

Kiselev, D. A. (*The Novourensk Research Station*). (*pp. 200–205*).

Among the wheat varieties produced by the station one of the most promising is Milturum 122, which is extremely winter-hardy, though rather prone to black chaff, especially in dry seasons. Ul'janovka, a selection from Belokoloska Bezostaja [Awnless White Ear] has outyielded the standard Lutescens 1060/10 by 1–4 c. per ha. and Durable by 4·2–6·8 c. It is early, hardy, free from shedding and lodging, resistant to *Puccinia triticina* and *Tilletia*, is uniform in habit, responds well to intensive conditions of cultivation and is superior in baking quality; its superiority in yield has been particularly marked when grown under irrigation.
Among the most frost resistant selections are some hybrids obtained by crossing the Saratov wheat-rye hybrid 45/130 with Erythrospermum 648.
The local rye has proved much hardier than any selected varieties and has consequently exceeded them in yield in all coldest years.

Šestakov, V. E. (*The Petrovsk Research Station*). (*pp. 205–09*).

Various improved winter wheat selections have been made from the local wheat Shmitovka and have proved very hardy, mid-early, productive and drought resistant. The hybrid Hostianum 122/76 is hardy, extremely drought-resistant, good in quality, early and productive; it is being further selected for increased frost resistance. Certain selections exceeding it in both drought resistance and yield have been made.
The wheat-rye hybrid Erythrospermum 52/1562 is hardy, productive, early and drought resistant.

897. 575:633(47)
SOLITERMAN, P. V. 575.3:633.1
(Zonal conference of workers in breeding stations, variety control centres and the seed variety store in the south).
Selektsija i Semenovodstvo (Breeding and Seed Growing) 1940 : Nos. 11–12 : 1–7.

The papers presented at the congress include instances of the conversion of spring cereals

into winter, of the improvement of yield and hardiness by intravarietal crossing, and of the improvement of yield by selecting under intensive conditions of cultivation and also by selecting under conditions of intense cold.

The wheat Kanred Fulcaster No. 266287, which has been renamed Vorošilovskaja, is increasing in popularity; it is resistant to *Puccinia triticina* and to frost and has outyielded Kooperatorka. A number of improved selections have been made from Buivolinka (cf. "Plant Breeding Abstracts", Vol. X, Abst. 379). The new winter wheat Lutescens 09 is much hardier than Ukrainka, and Artemovka, a selection from a local population, has proved superior to Lutescens 062 in quality, and is more resistant to Hessian fly.

Among the *Triticum durum* varieties Stakhanovka and Ljubimitsa are superior in both yield and quality, and two awnless selections are promising.

By selection in the spring barley 353 133 various new forms have been obtained, including one with three-awned spikelets, another which matures 10 11 days earlier than the initial variety and a third with lax ears and very large grains which has exceeded the standard by 15–25% in yield.

Deržavin described a vigorous, immune, hardy and highly productive amphidiploid obtained by crossing wild rye with the wheat Leucurum 1364 1 and pollinating the hybrid with perennial rye. It has exceeded Ukrainka by 1 to 2 times in yield and is being further crossed to remove the brittleness of the rachis. Perennial rye hybrids with tough rachis and large grain of the cultivated type have also been obtained and have given yields 20–30% above the standard varieties. Perennial hybrids have also been obtained in sorghum and sunflower. Khižnjak's amphidiploid *Triticum Agropyron* hybrid *Agrotritica* gives a luxuriant growth of both leaf and grain and is most promising for use as a fodder crop.

There were a number of papers on breeding and seed production in herbage plants.

898. 575:633(49.8)

Comunicări și referate în anul 1938. [Institutul de Cercetări Agronomice al României]. (**Communications and abstracts for 1938. [Rumanian Institute for Agronomic Research]**).

Anal. Inst. Cerc. Agron. Român. 1938 (1939) : **10** : 664–82.

These communications of the Rumanian Institute for Agronomic Research contain the following items of interest to plant breeders:—

Botez, I. — *Felul de a se comporta al câtorva varietăți de păr în procesul de fecundare.* (*The behaviour of certain pear varieties in the fertilization process*). (*p. 664*).

See Abst. 1072.

Constantinescu, G. — *Selectiunea clonală in viticultură aplicată cu privire în special la varietățile românești.* (*Clonal selection in practical viticulture with special reference to the Rumanian varieties*). (*pp. 665–66*).

See Abst. 1108.

Dumitrescu, C. — *Observațiuni asupra rezistenții la grindină a principalelor varietăți de vițe române și străine cultivate la Pepiniera Istrița, jud. Buzău.* (*Observations on resistance to hail in the main Rumanian and foreign vine varieties in the nursery at Istrița, jud. Buzău*). (*pp.* 667–68).

Observations were made on the behaviour of 12 Rumanian and 11 imported vine varieties after a hailstorm in July, 1937. The varieties varied in percentage of berries not damaged, from 64·4% in Pinot gris to 22·3% in Sélection Carrière.

Perepeliuc, C. — *Determinarea rezistenței la secetă a soiurilor de grâu de toamnă ce se cultivă în România după metoda vestejirii permanente a lui Tumanov.* (*Determination of the drought resistance of the winter wheat varieties grown in Rumania by Tumanov's method of permanent wilting*). (*p. 669*).

The most resistant varieties in pot experiments where watering was discontinued for 10 days

were Kooperatorka, 1.C.A.R.4 and Odvoş 241, the least resistant Ukrainka, Zemka and Cenad 117.

Popescu, S. — *Formaţiuni anormale la cartofi şi sfeclă; dovleci fără coaje; varietăţi şi rase noi de grâu.* (*Abnormal formations in potato and beet; gourds without epicarp; new varieties and races of wheat*). (*pp. 677–78*).

Forms of *Cucurbita Pepo* L. with seeds free from epicarp are found in Rumania and neighbouring countries but no such forms have been found in *C. maxima* Duch. Attempts to cross the two species have failed. Hybrids between varieties of *C. maxima* have been obtained however, particularly good sets having been observed when older pollen that has already turned red is used. Great variations in oil content of the seeds have been observed in the hybrids; variation has also been observed in a number of other characters. The thickness of the epicarp was transgressive in inheritance, some forms being so thick that they could only be cut with a knife. White fruit colour was dominant to pink and yellow.

The absence of the external layers of the seed coat is governed by cumulative factors which cause the seed coat to split and expose the cotyledons in *C. maxima* and give rise to the epicarp-free seeds in *C. Pepo*. The presence of these factors in *C. maxima* suggests that it should be possible to obtain epicarp-free seeds in this species.

The abnormalities referred to in beet consisted of polycephalic forms and forms bearing rosettes of leaves or small roots in place of branches on the floral axis.

Oescu, C. — *Câteva oveze sălbatece în România.* (*Certain wild oats in Rumania*). (*pp. 678–79*).

The forms referred to grow as weeds in cereal fields. They represent various varieties of *Avena fatua* L. subsp. *fatua* (L) and *A. sterilis* L. subsp. *Ludoviciana* (Dur.) Gill. et Magne.

Great polymorphism was observed in F_2 generations of natural hybrids found in fields of cultivated oats.

A homozygous fatuoid mutant was found in a pure line of *A. sativa* L. The second generation grains all presented the fatuoid complex.

Billeau, A. — *Experienţe şi cercetări asupra înrădăcinării portaltoilor americani şi europeo-americani.* (*Experiments and researches on root formation in American and European-American rootstocks*). (*pp. 679–80*).

See Abst. 1110.

899. 575:633(49.8)

Comunicări şi referate în anul 1939. [Institutul de Cercetări Agronomice al României]. (**Communications and abstracts for 1939. [Rumanian Institute for Agronomic Research]**).

Anal. Inst. Cerc. Agron. Român. 1939 (1940) : **11** : 443–87.

These communications of the Rumanian Institute for Agronomic Research contain the following items of interest to plant breeders:—

Anonymous. — *Secţiunea de ameliorarea plantelor.* (*Plant Breeding Section*). (*p 444*).

Experiments on selections, hybrids and élite plants have been continued.

Priadcenco, A. — *Corcii între diferite varietăţi, specii şi genuri la grâu.* (*Hybrids between different varieties, species and genera of wheat*). (*pp. 452–53*).

At the Staţiunea experimentală agricolă breeding has been carried out since 1930.

Line Tg. Frumos 1947/1935 has been selected from a local population. It is productive, very resistant to lodging and of good baking quality (Pelshenke No. = 115, Berliner index 16·5). From the same population Line Tg. 891/1935 was selected; it is productive, resistant to lodging, fairly early and of good baking quality.

From the variety American 15, two lines of good baking quality have been selected, namely Tg. Frumos Am. 15/5 with good grain and narrow leaves in the early stages and Tg. Frumos Am. 15/9—resistant to lodging and resembling American 15.

From the variety American 26 the station has selected lines resistant to brown rust. The line Tg. Frumos—Am. 26/21 multiplied by the station is resistant to *Puccinia triticina* and is early and has a good grain.
Crosses have been made (1) between the best varieties of the region and (2) between pure lines separated from local mixtures and varieties such as American 15, American 26, Zemka, Stepnjačka and Kooperatorka. The most promising are the crosses between the line Tg. Frumos 345 1929 and American 15 and 26, Stepnjačka and Ukrainka. Line Tg. Frumos 345 1929 is very resistant to lodging and has a good rhythm of development. It is rather weak for bread-making. It is hoped to transfer the resistance to lodging of the variety Tg. Frumos 345/1929 to American 15.
The F_4 has now been reached and one can begin to determine their commercial value.
Crosses have been made with ease between *Triticum vulgare* and *T. durum*. High fertility has been observed in the F_1 and certain new characters have been found in the lines extracted from the third and fourth generations, namely ears of the *vulgare* type with pubescent glume; ears of the *vulgare* type with the straw below the ear curved, as in the Albanian type, etc.
In general, these hybrids are low in resistance to frost and lodging, but fairly resistant to brown rust and very varied in form. The F_3 has been reached.
From a single *Aegilops* x *Triticum vulgare* cross 50 F_1 grains were obtained, giving rise to F_2 families.
To overcome the sterility the station has crossed these hybrids with hybrids of *durum* x *vulgare* and *Secalotricum* as well as studying their chromosome numbers.
Up to 1938 only six grains had been obtained from 2,203 wheat flowers pollinated with *Agropyron* pollen. In 1938 by crossing *durum* x *vulgare* and *persicum* x *vulgare* with *Agropyron* pollen, a large number of hybrid grains have been obtained.
Lines of *vulgare* which cross easily with rye have been selected. It has been found that the parental line selected has a distinct influence on the fertility of the F_1 hybrids and upon their resistance to frost and their baking quality. A line resistant to rust has been selected from the cross (Tg. Frumos 2525/1936).
Many lines have been obtained of the type *Secalotricum* Tg. Frumos, pubescent below the ear. Plants of the *Secalotricum* type have thick straw resistant to lodging. The new forms have been re-crossed with good lines such as: American 15, Stepnjačka and Kooperatorka with the object of obtaining further new forms.

Burlănescu, C. — *Rezultatele experiențelor cu soiuri de grâu și plante de nutreț la Valul lui Traian.* (*Results of experiments with strains of wheat and fodder plants in the Traian valley*). (*p. 455*).

Lines A 17 and A 15 are promising among the winter wheats; the spring wheats are all below the winter forms in yield and not regarded as of much interest.
The merits of various herbage plants are discussed.

Teodorescu, I. C. and Constantinescu, G. — *Contribuțiuni la studiul florilor și polenului la varietățile românești de vițe, propuse a fi menținute în cultură.* (*Contribution to the study of the flowers and pollen of the Rumanian vine varieties that it is proposed to maintain in cultivation*). (*p. 462*).

Certain varieties have proved pollen sterile and it is proposed to mix these in cultivation and also to carry out clonal selection and hybridization with a view to overcoming this sterility.

Săulescu, N. — *Rezultatele culturilor comparative cu in și cânepă.* (*Results of comparative tests with flax and hemp*). (*pp. 462–63*).

The flax varieties tolerated short periods of frost down to −7·5° C. without damage to later development. The best yield has been given by the Dutch variety Concurrent followed by F.496; the highest fibre content was found in Concurrent, followed by Linkopis. Concurrent was highest also in strength and elasticity of fibre.
The best hemp variety was Carmagnolla, followed by Fleischmann and Italian. The Plant Breeding Station at Cluj is carrying on experiments with Carmagnolla to increase its fibre percentage and earliness and their selections are being rapidly adopted by the growers.

Câmpineanu, D. — *Conținutul în azot al câtorva soiuri de grâu din culturile comparative.*
(*Nitrogen content of certain wheat varieties in comparative tests*). (*p. 471*).

Nitrogen determinations have been made on five of the main wheat varieties, namely Odvoș 241, Bankut 1201, A 15, Cenad 117 and I.C.A.R. 4. The highest nitrogen content was given by Bankut 1201 in nearly all cases, Cenad 117 coming second. As regards total production of nitrogen per hectare, however, the best variety was Odvoș 241.

Moșneagă, V. — *Rezultatele lucrărilor de ameliorarea porumbului din câmpurile de experiențe Băneasa și București.*
(*Results of experiments on improving maize in the experimental fields of Băneasa and Bucharest*). (*p. 474*).

Breeding work was started in 1930 with a number of heterogeneous populations of dent corn obtained from the Bucharest Academy Plant Breeding Section. Up to 1933 the ear to row method was used, after 1934, half ear per row, alternating with mass selection. Eighteen families were selected in 1931–33 and some of them were eliminated at the end of 1933 and 1934. There now remain lines I.C.A.R. 97/1932, I.C.A.R. 106 1932, I.C.A.R. 54 1933 and I.C.A.R. 58/1933. These four lines have given very satisfactory yields in years with sufficient rainfall and some have greatly surpassed the local forms and many selected forms; in dry years, however, they yield less well and are sometimes inferior to other lines which mature earlier or are more drought resistant; the same has been observed in the drier regions of the country.

By the second method 8 new families of dent corn have been obtained, some of which are 7–8 days earlier than those mentioned above.

Inbreeding work with maize has also been started.

Ceapoiu, N. — *Examinarea calității fibrelor de cânepă.*
(*Examination of the fibre quality of hemp*). (*p. 475*).

Microscopic and macroscopic examinations have been made on the fibres of a number of varieties and have shown the variety Carmagnolla to be the best, the next best being Sighișoara.

Anghel, G. — *Contribuțiuni la tehnica experimentărilor cu soiuri de cereale.*
(*Contributions towards experimental technique with cereal varieties*). (*pp. 476–77*).

Experiments on reduced size of plots, seed rate and marginal effect are reported.

Săulescu, N. — *Porumbul galben timpuriu.*
(*The maize Yellow Early*). (*pp. 477–78*).

A description is given of the variety, which is a selection from Mauthner 13 Weeks; although it is early and short it bears large cobs and large grains. It ripens at the end of August, its vegetation period being 110–120 days. It has greatly outyielded the varieties Ardelean Varady and Portocaliu de Ezăreni, giving yields of the order of 5,000 kg. per ha. in large scale tests. The grains are of good quality, large and rich in oils, mineral salts and proteins.

Căpriță, Ș. — *Procentul de fibre la inul din câmpurile de experiență.*
(*Fibre percentage of flax in field tests*). (*pp. 478–79*).

Pieces of stem 20 cm. in length have been examined by Bredemann's chemical method in 9 varieties of flax from 11 different experimental plots. The highest fibre content was found in the variety Concurrent, while Linkopis, F. 496 and Kronsaad have also given good results. Experiments have been made also on manuring, time of sowing, etc., and on straw yields.

Ioniță, M. — *Metoda și rezultatele analizelor de rezistență și elasticitate cu dinamometrul la soiurile de in din culturile comparative.*
(*Methods and results of dynamometer determinations of resistance and elasticity in flax varieties in comparative tests*). (*pp 479–80*).

Resistance tests were made with the Louis Schopper dynamometer. The variety Concurrent gave the highest figures and F.496 the lowest, with Linkopis and Kronsaad intermediate.

Crăciun, E. — *Determinarea procentului de fibre la soiurile de cânepă din diferite câmpuri de experiență.* (*Determining the fibre percentage of lines of hemp in different experimental plots.*) (*p. 483*).

Cut stems 20 cm. in length and weighing 20 grm. each were examined in 4 replications. The lowest fibre content was found in the variety Fleischmann with 12.83, the highest and most constant being the variety Italian, with 18·22 to 21·59%. The yield of fibre per hectare, however, was highest and most constant in Carmagnolla, with 1,368 kg. per ha. and Fleischmann with 1334.

Șerbănescu, N. — *Analiza procentului de fibre la câteva soiuri de cânepă în diverse regiuni.* (*Analysis of the fibre percentage of certain varieties of hemp in various regions*). (*p. 486*).

The varieties were classed in the following order: (1) Italian, (2) Transylvanian and (3) Local.

900. Levčenko, L. P. 575:633:581.143.26.03

(The question of the influence of geographical co-ordinates on yield and regional distribution of varieties).

Selektsija i Semenovodstvo (Breeding and Seed Growing) 1940 : Nos. 11–12 : 7–13.

Data on the behaviour of a number of varieties produced by the Kharkov breeding station show that many of them are not suitable for growing in a number of zones not far removed from the station, especially towards the south and west; this area being lower in altitude it is found that sowing is carried out 8–12 days earlier and the varieties thus grow up in a shorter day than that to which they are accustomed and their yield is depressed correspondingly. It is pointed out that a difference of 65 m. in altitude is equivalent to a difference of 105 km. in latitude and that the position of a breeding station should be very carefully chosen in respect of this and other features, so as to be fully representative of the region it is to serve. In fact the ideal would be for a station breeding long-day crops to be situated in the lowest and most southerly part of the area, so that the varieties it produced would, when grown in the other parts, meet with more favourable conditions of day length rather than less favourable. For short-day plants the conditions are reversed. Variety testing should of course be carried out in all typical districts of the area.

901. Salter, R. M. 575:633–1.4

Integrating soil and crop research.

J. Amer. Soc. Agron. 1941 : **33** : 237–45.

Inter alia it is suggested that co-operation between plant breeders and soil scientists would be of value in connexion with such problems as drought resistance, resistance to injury by heaving and adaptation to different levels of nutrient supply.

902. 575:634(76.1)

Isbell, C. L. 575:635(76.1)

The value of native material in breeding horticultural crops for Alabama.

Proc. Amer. Soc. Hort. Sci. 1941 : **38** : 599–604.

Survey and collection of native and local types of grapes, blueberries, sour cherries, pecans, black walnuts, snap beans, onions, cowpeas, lettuce, turnip and water melons show that they cover a wide range of variability and include valuable material for the breeding of fruits, nuts and vegetables adapted to Alabama conditions, which are not well served by the existing named varieties.

GENETICS 575.1

903. 575.1(47)

Dvorjankin, F. 575:633–1.524

(Summing up).

Jarovizacija 1940 : No. 5 (32) : 23–34.

The author outlines the views of the early geneticists and of the Mendelian school, referring particularly to the great interest taken in the gene centres and the varieties obtained from these centres. This is thought to account for the neglect of the local strains on the part of so

many breeders, to the grave detriment of Soviet plant breeding. Examples are given of the superiority of the local strains and of selections based on them over anything in the World Collection, the value of which is thought to have been overestimated.

904. Belgovsky, M. L.,
Kirpichnikov, V. S. and
Prokofyeva-Belgovskaya, A. A. 575.1:576.3
(**Organization of the cell and the chromosome theory of heredity**).
Bull. Acad. Sci. U.R.S.S., Sér. Biol. 1940 : No. 5 : 662–87.

The authors give a careful and accurate exposition of genetical theory, of the experimental evidence on which it is based and of the modifications made in the theory in accordance with recent developments and discoveries; a number of points on which misconceptions have arisen in the U.S.S.R. are cleared up.
The editor adds a footnote to the effect that he "is not in agreement with many of the authors' views and considers that a solution of the questions concerned will only be possible by a synthesis of the positive achievements of cytogenetics and developmental biology, the zygote and developing organism being regarded as a whole and in the closest relationship with the environment."

905. Popravko, A. V. 575.123:633.2
(**The methods of selecting perennial herbage plants**).
Jarovizacija 1940 : No. 5 (32) : 119–21.

The inbreeding method has proved a complete failure, mass selection and family selection having given the best results, especially when a wide range of pollen types was available. The progeny of different plants differed sharply but within each family great uniformity was observed. A certain amount of variability is in any case regarded as an advantage and attempts to attain uniformity have almost invariably resulted in loss of yield.

906. Andrés, J. M. 575.14:633.15:575.12
La consanguinidad y los métodos modernos de mejoramiento. (**Consanguinity and modern methods of breeding**).
Jorn. Agron. Vet., B. Aires 1939 (1940) : 549–72.

The use of S. Wright's coefficient of consanguinity is explained, after which the method of crossing inbred lines of maize and its various modifications are described. Particularly vigorous hybrids have been obtained by crossing local strains of maize with North American varieties. The author proposes to extend the work on these wide crosses.
The application of the results to animal breeding is illustrated.

907. Kausche, G. A. and
Stubbe, H. 575.243:537.531:632.8:633.71
Zur Frage der Entstehung röntgenstrahleninduzierter Mutationen beim Tabakmosaikvirusprotein. (**The question of the origin of mutations induced in tobacco mosaic protein by X-rays**).
Naturwissenschaften 1940 : **28** : p. 824.

A note on some further evidence from experiments to elucidate the way in which mutants arise in tobacco mosaic virus after X-ray irradiation. Having considered various possibilities, the author inclines to the view that the mutations obtained were not due to a direct change in the virus molecules, elicited by the altered substrate, but that they arise in the actual course of reproduction of the virus molecules in the altered substrate, provided that protein synthesis in the irradiated organism is not inhibited by a general cessation of growth. The alteration is brought about by defective synthesis of or in the altered substrate followed by identical reproduction of the virus.
Further lines of research are being followed up. (Cf. "Plant Breeding Abstracts", Vol. IX, Abst. 1422.)

908. 575.257
(**Work on grafting and vegetative hybridization**).
Jarovizacija 1940 : No. 5 (32) : 141–43.

Various brief articles have been sent to the editor, and are reproduced. They contain the following points:
O. P. Šubina has crossed *Solanum acaule* with domestic potatoes and obtained 20 large seed

balls containing a large number of seeds. The hybrids resembled *S. acaule*, the maternal parent, in type. The hybrid *S. acaule* x Jubel withstood –5° C. without damage and seedling No. 1 from *S. acaule* x Fürstenkrone is also promising. Grafts were made of various domestic varieties on these hybrids and resulted in a marked reduction in length of stolon, and an increase in tuber development and alterations in the form and flavour of the tubers.

V. M. Ržavitin grafted the Pritchard tomato on to the potato Lorkh, from which all the leaves were removed. All flower buds and side shoots were removed also from the tomato scion. The tubers obtained from the potato sprouted earlier than the control plant of Lorkh ungrafted and the resulting plants differed in habit.

A. V. Jafaev made grafts of pea upon lupin, broad bean and *Cicer arietinum*; seeds obtained from the scions were sown and grafts made from the seedlings again on the same rootstock to effect vegetative rapprochement. Crosses will then be made between the scion and stock.

N. Petrosjan grafted the tomato Budennovka on the Epicure potato; the fruits formed on the scion differed from those of the control and the seedlings obtained from them also showed some resemblance to Epicure.

A. S. Kružilin, J. E. Plotnikov and S. V. Anan'eva carried out grafts between different varieties of potato, sunflower and wheat respectively, in which the characters of the scion were modified. Vegetative hybridization experiments in wheat are also in progress.

A. I. Saks has carried out experiments with vegetative hybridization in wheat.

P. A. Kotočigov has made experiments on vegetative hybridization in wheat, barley and oats.

A. A. Zalkaln grafted F_1 cucumber hybrids on the parent forms at a more advanced stage of phasic development.

M. Boženova made grafts between different species of lupin and noted various modifications of the vegetative organs, pods and seeds.

A. S. Molostov and E. A. Soročenskaja obtained seeds from lentils grafted on broad bean; out of 26 pods formed, two were empty, one contained two seeds and the rest one each.

G. V. Kopel'kievskii, having failed in crosses between common buckwheat (*Fagopyrum esculentum*) and *F. tataricum*, grafted the two species and obtained a number of seeds, some of them deformed. The seeds have been sown.

Similar experiments have been made with common buckwheat and *Polygonum Neyrichii*.

909. Kružilin, A. S. 575.3
[The physiology of variation and inheritance in plants (A working hypothesis)].
Socialistic Grain Farming, Saratov 1941 : No. 1 : 142–49.

The author presents his own interpretation of the phenomena, ascribing greater importance to physiological effects and less to chromosomes and genes than is usual in current genetical interpretations. Thus amphidiploidy is viewed as one of the results of the many changes induced by colchicine, not as the cause of these changes. It is maintained that by applying the right environmental influences hereditary changes can be induced in a desired direction, and that the hereditary basis of an organism is only relatively stable, undergoing constant change and thereby enriching itself in the course of growth and development.

910. Prezent, I. 575.3:581.162.3
(Selective fertilization).
Jarovizacija 1940 : No. 5 (32) : 137–39.

The Mendelian view of selective fertilization is interpreted as merely competition between the pollen grains, the modern Darwinian view postulates a mutual action between pollen and ovule in which the most compatible combination is selected. This is however only the best combination from the agricultural standpoint when the biological and agricultural standpoints coincide. Where breeding is for vegetative organs, as in say sugar beet, the pollinators available must be strictly chosen. In view of the mutual nature of the selective process as great a range as possible of both mother plants and pollen parents should be made available in all cases. The growth conditions, position on the plant, etc., of the flowers to be pollinated should be the optimum. The best effect will be attained where the two parents respond to the same environmental conditions, thus in intravarietal crossing, for the same reason local varieties are the best for use as mother plants. On the other hand if breeding is for some new set of conditions, then wide crossing is recommended, to provide the widest range of possible new adaptations.

911. GATES, R. R. 576.12:575.24
Processes of organic evolution.
Science 1941 : **93** : 335–39.
The author is of the opinion that both large and small mutations are important in evolution.

912. LUDWIG, W. 576.12:575.4:575.24
Selektion und Stammesentwicklung. (**Selection and phylogeny**).
Naturwissenschaften 1940 : **28** : 689–705.
This is a critical essay on the problem of the mechanism or mechanisms of evolution and phylogenetic development in the plant and animal kingdoms. Evidence bearing on the relative significance of selection and mutation as factors in the evolutionary process is discussed and the need for limiting the importance of chance as a causal agency in selection is stressed. An extensive bibliography of recent literature is appended.

CYTOLOGY 576.3

913. YAMAHA, G. 576.3:578.08:537.61–15
(**Application of infra-red photomicrography to cytology**).
Bot. and Zool. 1937 : **5** : 2263–64.
A brief note on the use of infra-red photography in cytology with some advice on the technique.

914. SUEMATSU, S. 576.312.315
(**Studies on nucleoli in plant cells. Parts 1–3**).
Bot. and Zool. 1937 : **5** : 1876–81, 2042–48, 2217–23.
A survey of the contributions of research workers in different countries throughout the world to the various problems pertaining to the structure of the nucleolus and the correct interpretation of its behaviour and its functions in the life of the cell.

915. GEITLER, L. 576.312.34
Neue Ergebnisse und Probleme auf dem Gebiet des Chromosomenbaues. (**Recent results and problems in the sphere of chromosome structure**).
Naturwissenschaften 1940 : **28** : 649–56.
A concise and well documented survey and critical analysis of recent cytological research on the gross and microscopic structure of chromosomes; specialization and its underlying structural basis and the chromonema; the chromomere and heterochromatin; and their nature and functions in relation to the gene concept. The author leans towards the view that changes in spiralization are responsible for many of the observed phenomena and that the linear order of the genes is capable of interpretation on the assumption that they consist of side-chains along a continuous polypeptide chain serving as basis.

916. FAGERLIND, F. 576.356.5
Die Eigenschaftsregressionen der Polyploide. (**The character regressions of polyploids**).
Chronica Botanica 1941 : **6** : 349–50.
On the grounds that old established polyploids in nature often lack gigas characters, the author has put forward the hypothesis that these characters regress in the course of time. The process has been observed in a moss with doubled chromosomes. Concurrently with this regression goes a diminution in chromosome size and the processes may be causally related.

917. BRESLAVEZ, L. P. 576.356.5:581.4
(**Methods of detecting polyploid plants at different stages of development**).
Bull. Acad. Sci. U.R.S.S., Sér. Biol. 1940 : No. 5 : 706–16.
Irregularities of development of the cotyledons or of the first foliage leaves, anomalous branching of the axis of the seedling, and such pronounced deformities are not the only ways of recognizing polyploid plants, nor are they infallible signs of polyploidy. Other methods referred to include determining the size of the stomata, in illustration of which tabulated data are given; various exceptions are also mentioned. In using this method it is recommended that the mean dimensions of the stomata on 10 control plants be taken for comparison; that all

leaves should be taken at the same stage of development and examinations be made on the same regions of the leaf, the lower epidermis being preferred to the upper since it is less liable to be damaged; that both the breadth and length of the guard cells be measured and the area of the stomata be calculated—this gives a much more sensitive index than either the length or breadth alone.

Other features of polyploids are the irregular form of the cells adjacent to the stomata, the larger nuclei of the epidermal cells, the larger number of nucleoli, which are often of an unusual form, and the larger pollen. No single one of these criteria is infallible but when a number are taken together a high degree of certainty may be obtained. The only final criterion is the nature of the progeny.

918. Straub, J. 576.356.5:581.46:633.367
Quantitative und qualitative Verschiedenheiten innerhalb von polyploiden Pflanzenreihen. (**Quantitative and qualitative differences within polyploid plant series**).
Biol. Zbl. 1940 : **60** : 659–69.

A comparison of quantitative and qualitative changes in the flowers of the different polyploid series in *Antirrhinum, Torenia, Impatiens* and *Lupinus*. R. M. I.

BOTANY 58

919. Gustafson, F. G. 581.163.04:577.17
Probable causes for the difference in facility of producing parthenocarpic fruits in different plants.
Proc. Amer. Soc. Hort. Sci. 1941 : **38** : 479–81.

In experiments with water-melon, cucumber, pumpkin, squash and tomato, naphthalene acetic acid was found to be more active in inducing parthenocarpy than indole butyric acid, which in turn was better than indole acetic and 4-fluorene acetic acids.

Though wide differences were found in the growth hormone content per unit fresh weight of the ovaries of the different vegetables, they could not be taken as proving the hypothesis that the ease with which parthenocarpy can be induced is positively correlated with the growth hormone content of the ovary.

920. Ivanov, N. N. and 581.192:578.08
Dodonova, E. V. 633.85:581.6:578.08
(**Determination of albumen content in seeds of leguminous and oil plants with the help of colorimetric method**).
Proc. Lenin Acad. Agric. Sci. U.S.S.R. 1940 : No. 20 : 23–26.

The method is applicable to cereals as well as legumes and oil plants. Finely ground flour ((0·5–0·8 grm.) of the particular cereal is mixed with 3–4 grm. of sand and triturated with 0·2% Na OH in 50% alcohol. The extract is filtered through cotton wool and to 10 ml. of solution are added 1 ml. 30% Na OH and 1 ml. 5% Cu SO_4, whereupon the mixture is shaken and centrifuged for 3–5 minutes. The colour of the solution is compared in a colorimeter with standard solutions obtained from flours of known composition and gives the protein content of the flour.

For leguminous seeds a 5% solution of Na Cl containing 0·2% Na OH is used as the solvent, and for oil seeds this same solution is used warm, with the later addition of a little ether, or alternatively an excess of Na Cl and Cu SO_4. The results obtained by this rapid method have been in close agreement with those obtained by Kjeldahl's method, even in lupins, where the presence of alkaloids has not in any way interfered with the determinations.

921. 63.00.15(91.1)
633.63:575(91.1)
H....., F. S. 633.00.14(91.1)
Plant Science Research in Iran.
Chronica Botanica 1941 : **6** : p. 353.

Work at the Agricultural College in Karadj includes sugar beet breeding under Dr Schneider and variety tests of numerous field crops by Professor Ataiy.

922. Lange-de la Camp, M. 632.451:576.16:633.11–1.521.6
Blüteninfektionen mit Myzel von *Ustilago tritici*. (**Flower infections with mycelium of *U. tritici*).**
Z. PflKrankh. 1940 : **50** : 142–50.

At the Plant Breeding Station in Halle a genetical study of the cereal smuts from the standpoint of differences in virulence has been undertaken. Problems have arisen in regard to the method of obtaining haplont lines of different sexes from injection into the experimental host and to actual method of infection The present paper contains a description of the writer's technique of infecting wheat with different race groups of *U. tritici* with records of the differences in virulence of the various lines. Further investigations on a larger scale are needed in order to determine the possible genetical basis of the differences found in the reactions.

923. Holton, C. S. and
Fischer, G. W. 632.451.2:633.13:575.127.2
Hybridization between *Ustilago avenae* and *U. perennans*.
J. Agric. Res. 1941 : **62** : 121–28.

Ustilago avenae (which attacks oats and wild oats) and *U. perennans* (which infects tall oatgrass) were hybridized by inoculating wild oats with compatible monosporidial combinations of the two species. Segregates having a pathogenicity similar to that of the *U. avenae* parent were recovered from the hybrid chlamydospores by inoculating Anthony oats but segregates behaving like the *U. perennans* parent were not recovered from similar inoculations on tall oatgrass.

924. Holton, C. S. 632.451.2:633.13:576.16:575.1
Further studies on the oat smuts, with special reference to hybridization, cytology, and sexuality.
J. Agric. Res. 1941 : **62** : 229–40.

Seven physiological races of the buff smut of oats (cf. "Plant Breeding Abstracts", Vol. VI, Abst. 1179) are described. These races arose either by mutation or from hybridizations with *Ustilago avenae* or *U. levis*. The cytology of the buff smut fungus was also investigated. Mature chlamydospores contain a single diploid nucleus and reduction division accompanies spore germination. Powdery sorus type is a simple dominant to indurate sorus type. The participation of sporidia in the fusion process appeared to be dependent, at least in part, upon the "physical" condition of the sporidia rather than upon their sex.

925. Săvulescu, T. and
Sandu-Ville, C. 632.451.3:576.16:633.11(49.8)
Încercări pentru stabilirea raselor fiziologice la cele două specii de *Tilletia* ce produc malura grâului în România. (**Attempts to determine the physiological races of the two species of *Tilletia* which cause wheat smut in Rumania**).
Anal. Inst. Cerc. Agron. Român. 1938 (1939) : **10** : 518–631.

Infection tests with spores from infected ears from various parts of the country were made in 1932–33 on the following varieties: American 26, Cenad 117, Cenad 1275, Banat local, Cipăianu 714, American 15, Cenad 1252, Bălan 7, Odvoş and Dioszeg 46.
Spores of different provenance were found to differ in virulence in both *T. Tritici* and *T. foetens* and at least 2 races of each fungus are presumed to exist.
Of the varieties tested Bălan 7 has proved the least susceptible to attack while American 26 and 15 were most susceptible, these being the varieties most resistant to rust.
The tests were continued in the following two years, the varieties being as follows: *Triticum monococcum, T. dicoccum, T. durum, T. turdigum, T. polonicum, T. Spelta* and the *T. vulgare* varieties Banat, Sandu-Aldea 53, Miercurea Ciucului 122, Cipăianu 714, American 15 and American 26. As regards *T. Tritici* 2 physiological races were shown to exist, differing in size of spores; differences in virulence led to the supposition that at least 3 other races also exist.
As regards *T. foetens*, 5 races have been found.

926. VALLEGA, J. 632.452:576.16:633.11–1.521.6
Especialización fisiológica de *Puccinia graminis tritici* en la Argentina, Chile y Uruguay. (**Physiological specialization of *P. graminis tritici* in Argentina, Chile and Uruguay**).
Rev. Argent. Agron. 1940 : **7** : 196–220.

After detailed discussions of the characters, distribution and origin of the S. American races of black stem rust the author examines the question of varietal reaction. Little or no breeding for resistance has been done and none of the common local wheats is resistant to all 7 of the physiological races isolated. Kanred and Reliance are resistant to races 17, 14, 21 and 42, Barrukan [(B. x R.-C) x Kanred] to 14 and 17, Guatraché and Utracan (both selections of Kansas) to 14 and 21, La Previsión 32 and 34 to race 42 and Bonaerense, Húngaro and Rieti semi-resistant to the most virulent of the races present, race 15. Two hybrids of the Instituto Fitotécnico de Santa Catalina (S. Catalina Institute of Applied Botany) are distinguished by resistance to the most widespread races, namely 11, 14, 17 and 42, but are attacked by races 15, 21 and 36. Certain hybrids of Hope x Lin Calel are resistant to races 36, 14 and 17. Certain hybrids of the variety Kenya are also interesting in that they show an X reaction (intermediate) to all races.

CEREALS 633.1

927. ENGELKE, H. 633.1:575:664.641.016
Weizenertrag und -güte als Züchtungs- und Düngungsfrage. (**Wheat yield and quality as a problem in breeding and manuring**).
Züchter 1941 : **13** : 49–59.

This paper discusses in detail the respective roles and relative importance of breeding and of manuring in improving the yield and quality of wheat. From his review of the experimental results obtained from Lauchstädt and elsewhere, the author reaches the following general conclusions:—

Yields have been most markedly affected in winter wheats by suitable manuring with nitrogen —the effect in spring wheats was not so marked. In the last decade plant breeding has also been an important factor in increasing the grain yield of wheats.

Gluten content, though markedly influenced by the variety, is now mainly a problem in judicious manuring.

Yield of gluten was most affected by manuring. One spring wheat Kessler's Early Red is specially cited as having shown in the Lauchstädt trials a combination of high grain yield with high yield of gluten. Unfortunately, however, its gluten quality is poor and it tended to lodge and was infected with mildew in two years. Still, both this variety and the winter wheat Heine I are regarded as worth further study. The problem of increasing the yield of gluten is however being studied primarily as a question of manuring.

On the other hand, the improvement of gluten quality can only be attained by the breeder. Heine's Koga has shown a combination of the highest gluten quality with high grain yield.

928. PUKHAL'SKII, A. V. 633.1:575.43:575.3
(**Improvement of self-pollinated varieties**).
Jarovizacija 1940 : No. 5 (32) : 48–56.

Figures are given showing that multiplication accompanied by selection for agronomic and biological characters, intravarietal crossing and intensive conditions of cultivation produces a supply of seed which gives considerably higher yields than the seed raised by the old accepted methods of seed production. Increases of 2·3 c. per ha. have been registered for Lisitsyn rye, 1·89–3·06 c. for Lutescens 062 spring wheat and similar differences for other varieties and crops. The succeeding generation grown from the two lots of seed under identical conditions showed similar differences.

Different families of the winter wheat Erythrospermum 0917 differed in winter survival, one family having a survival of 70·28% and an adjacent family only 14·73%. Differences were also observed in such characters as height of plant, number of ears per plant and 1,000 corn weight. The protein content of different families of the pea Mandorf Victoria varied from 19·75 to 23·79%.

Eleven families of Erythrospermum 0917 differing in yield were sown in 1939 and in 1940 the seedling families showed clear differences in vigour of growth, tillering, length of ear, size of grain and yield, though morphologically they were identical.

Similar differences were observed in the spring wheat Lutescens 062. The families within themselves were extremely uniform.
By continued selection on these lines it should be possible to effect very material improvements in the varieties at present existing.

WHEAT 633.11*

929. Kravčenko, Ju. S. 633.11:001.4:578.08
(On varietal names).
Selektsija i Semenovodstvo (Breeding and Seed Growing) 1940 : No. 10 : 27–29.

The author gives further illustrations of the need for precise varietal naming (cf. "Plant Breeding Abstracts", Vol. XI, Abst. 650) and stresses the desirability of stating the place of origin rather than the botanical variety in any varietal name and of simplicity: such names as "29–715 Khos-Khoz" are deprecated.

930. 633.11:537.531:581.142
Fröier, K. 633.13:537.531:581.142
Keimung und Triebkraft bei Hafer und Weizen nach verschiedenen Röntgendosen. **(Germination and sprouting ability of oats and wheat following different X-ray dosages).**
Hereditas, Lund 1941 : **27** : 360–70.

Experiments were performed to determine the X-ray dosages necessary to reduce the germination to 5–20% (the percentage at which most mutants are obtained in barley) for Victory oats and for diploid, tetraploid and hexaploid wheats. A dosage of 45,000 to 55,000 r is the value for Victory oats (water content 13%). For the wheat species (water content about 9%), a dosage of 25,000 r gave 64% germination for *Triticum vulgare*, 25,000 r gave 76% germination for *T. durum*, 15,000 r 100% germination for *T. dicoccum* and 15,000 r 60% germination in *T. monococcum*. The dosages for 5-20% germination were thus not found for the wheats.

931. Pokhil', I. F. 633.11:575(47)
(The new variety of winter wheat Stakhanovka).
Selektsija i Semenovodstvo (Breeding and Seed Growing) 1940 : No. 10 : 13–14.

The variety Erythrospermum 015, now named Stakhanovka, was produced at the Verkhnjačka breeding station from a cross of T/389 x Ukrainka. It has given yields varying from 35 to 48C. per ha. and has been classed as the best quality wheat of the Soviet Union, having received a mark of 3·8 as against 2·5 for Ukrainka. It is early, fairly resistant to frost and smut, resistant to drought and rust. It is replacing Ukrainka and Zarja in the areas where these are grown.

932. Kühl, O. and
Sârbu, N. 633.11:575(49.8)
Rezultatele experienţelor cu şase soiuri de grâu de toamnă pe anii 1933–36.
(Results of experiments with six varieties of winter wheat in the years 1933–1936).
Anal. Inst. Cerc. Agron. Român. 1938 (1939) : **10** : 214–32.

Studies were made of the varieties I.C.A.R.7, I.C.A.R.4, Siret 1/3, I.C.A.R.5 and A.15, with Cenad 117 as standard. Descriptions are given of the varieties with indications of their origin. Reports are then given of observations on various physiological characters. Lodging resistance was highest in Siret 1/3, followed closely by A.15 and Cenad 117; drought resistance was highest in I.C.A.R.7 and 4, resistance to brown rust and black stem rust highest in A.15 and Siret 1/3; A.15 was the only variety to ripen before the standard, which it preceded by 1 day, and to exceed it significantly in yield, which was 15·1% higher in 1932–33 and 6·1% higher over the period of 4 years; I.C.A.R.5 gave the lowest yield. The 1,000 corn weight was highest in the standard and lowest in I.C.A.R.4, which had the highest hectolitre weight. A.15 had the highest grain percentage and I.C.A.R.5 the lowest. Siret 1/3, I.C.A.R.7 and Cenad 117 were classed as vitreous, the rest as starchy or intermediate. The flour extraction was highest in I.C.A.R.5 and 7 and lowest in Siret 1/3, the gluten content highest in Siret 1/3 (10·53% as compared with 9–10% in all other varieties); the dry gluten content was directly

*See also Absts 896-899, 927 and 928.

proportional to the percentage of total nitrogenous substances. Cenad 117 was classed as the best in baking quality, followed by A.15.
Siret 1/3 gave the greatest yield of straw, A.15 the least.
The authors conclude that for the Bucharest region the best varieties are A.15 and Cenad 117. However Siret 1 3 is promising as regards yield, resistance to lodging and rust, and gluten content, though it is low in baking quality and late in maturity. I.C.A.R.7 and 4 are of interest for the drier zones.

933. 633.11:575(49.8)
633.13:575(49.8)
633.16:575(49.8)

Popescu, Ş.

Rezultatele culturilor comparative cu soiuri de grâu, orz, ovăz, în Moldova întregită în anii 1933–1937. (**Results of comparative tests of varieties of wheat, barley and oats in Moldavia in the years 1933-1937**).

Anal. Inst. Cerc. Agron. Român. 1938 (1939) : **10** : 141–91.

Since the previous series of observations for 1929-1932 the local varieties have come more to the fore and commercial varieties have become less prominent. The results show that the local forms, when made somewhat more homogeneous, are the most successful. Statistical data are given on yield and quality of the best lines—that is those lines that have maintained their superiority for three or more years.
In all 62 winter wheat varieties were studied, including both local and imported forms. Descriptions are given of those varieties not appearing in the earlier study which have proved at all promising; these comprise American 15, Todireşti 32, Târgu Frumos 345, Zemka, Ukrainka and Kooperatorka; the origin is indicated in each case, and the regions for which each variety is suited. Data are also given on a number of physiological characters: resistance to frost was rare, moderate rust resistance was observed in A.15 and Târgu Frumos 345, smut resistance was present in all varieties except Todireşti 32, which is otherwise an excellent variety; resistance to lodging was greatest in Târgu Frumos 345 and least in Kooperatorka; drought resistance was high in Ukrainka in spite of this being a late maturing variety; maturity was earliest in A.15, whilst Ukrainka was the latest. The best yields were given by C.15, Todireşti 32, Zemka, Kooperatorka and Ukrainka; the most regular in yield were Kooperatorka and Stepnjačka. The straw yield was highest in the local populations and lowest in Odvoş 156 and Târgu Frumos 345. No marked differences between the varieties were noted as regards grain percentage or hectolitre weight; the 1,000 grain weight was highest in the variety Szekacs and lowest in Kooperatorka. Vitreousness varied too much with conditions for any varietal classification to be made. The general conclusion reached is that A.15 and Todireşti 32 are the varieties most suitable for the driest zones, Ukrainka, Zemka and Kooperatorka for more humid zones—Cenad 117, Odvoş 156 and 241 for the western part of the country.
Similar data are given for barley, 35 lines of which were studied. The highest rust resistance was found in Isaria, smut resistance in Abed opal, Cenad 3 and the local lines, standing capacity in Isaria and the local strains; the local strains ripened before Abed opal and Hanna, which were the earliest of the commercial varieties; grain yield and percentage and 1,000 corn weight were highest in Abed opal, straw yield and hectolitre weight in Isaria. As Abed opal is clearly the best variety, hectolitre weight is not thought to be a reliable test of quality. Isaria is placed second in order of merit. The local selections from Târgu Frumos however are regarded as more promising for the local conditions.
Thirty-seven varieties of oats were studied on the same lines. Rust resistance was highest in Cenad 88 and Cenad 2; standing capacity was low in Biharia but good in all the others. All varieties were later than the standard, Cenad 88; the local strains are earlier in the south than in the north, a difference not observed in the commercial varieties: it is concluded that lines selected in the south of the country will be better therefore than those selected in the north. In yield there was little to choose between any of the local varieties Cenad 88, Cenad 2, Cenad 97 and the Târgu-Frumos populations, illustrating once more the value of the local strains for breeding purposes. Straw yield was higher in the populations than in the commercial varieties, the latter being more homogeneous in time of ripening. Husk percentage was lowest in Cenad 2. The other characters were very variable and no varietal differences could be established. The varieties Cenad 2 and 88 are classed as the best and among the populations those from Târgu Frumos take first place.

934. *Sârbu, N. and Kühl, O. 633.11:575(49.8)
Studiu comparativ al soiurilor de grâu de toamnă "Sandu-Aldea" obținute prin hibridare. (**Comparative study of lines of the autumn wheat "Sandu-Aldea" obtained by hybridization**).
Anal. Inst. Cerc. Agron. Român. 1938 (1939) : **10** : 254–81.

Fifteen F_3–F_4 families of the cross Bălan x Teverson have all been discarded as quite useless for further breeding. On the other hand 22 families of advanced generations of the cross Bălan [White] x Squarehead have been studied over a period of 5 years in comparative field tests, attention being paid to all the main biological and economic characters. The lines studied were Sandu-Aldea 722, 752, 811, 872, 879, 889, 892, 893, 895, 904 and 905, Cenad 117 serving as standard. Descriptions of all the lines are given.

Data are given regarding the reaction of the lines to frost, lodging, drought and rust, and in respect of vegetation period, grain yields in good and bad years, thousand corn weight, hectolitre weight, grain percentage, vitreousness and straw production.

The general conclusions reached are that (1) the Sandu-Aldea lines are less hardy than the standard, except Sandu-Aldea 889 which is equal to the standard. (2) all are more resistant to lodging than the standard. (3) all are more susceptible to drought than Cenad 117. (4) only Sandu-Aldea 879 and 889 can be considered more rust resistant than Cenad 117. (5) all are later than Cenad 117, by 3–7 days. (6) only Sandu-Aldea 889 has outyielded the standard by a small difference which was not significant. (7) only Sandu-Aldea 892 and 893 are more vitreous than the standard and line 889, which is promising in so many respects, is the most starchy of all. (8) none of the lines therefore combines the properties that Professor Sandu-Aldea wished to combine in making the cross Bălan x Squarehead. Line 889, which is productive, resistant to frost, lodging and rust, and the earliest of all the hybrids, is still 3 days later than the standard and classed lowest of all in respect of vitreousness. (9) all the hybrids have inherited from Squarehead both its strength of straw and its late maturity and susceptibility to frost and drought. (10) in order to achieve the necessary improvement in the local wheats it will be necessary to cross the local forms with good foreign varieties from countries with conditions similar to those of Rumania or even less favourable.

935. Geddes, W. F. 633.11:575:664.641.016
Objectives in breeding for improved quality in hard wheat.
J. Amer. Soc. Agron. 1941 : **33** : 490–503.

Most of this article is a review of work on the milling and baking qualities of hard wheats. It is suggested that, where the present types of wheat are satisfactory in quality, the plant breeder should endeavour to produce new varieties which have the desired agronomic characteristics (resistance to diseases, lodging and insect attack, etc.) and which are as similar as possible in grading, milling and baking characteristics to the superior existing varieties.

936. Koblet, R. 633.11:575:664.641.016
Über die Eiweissbildung im Getreide. (**On protein formation in the cereal grain**).
Schweiz. landw. Mh. 1941 : **19** : 122–34.

A physiological study of the subject from various aspects including a brief review of the genetical basis underlying the composition of the wheat grain.

937. Wada, E. 633.11:575–181
(**Some giant plants of wheat**).
Plant Breed. News 1934 : **9** : 749–51.

From the cross Kinai 114 x Konosu 26 at Kyushu Wheat Experiment Station a giant plant with 33 ears was obtained. Its grain and rate of growth were quite satisfactory. Another similar plant was discovered in the same cross.

Another giant plant with 39 ears (weighing 80 grammes) occurred in the variety Ejima Shinriki. On sowing the grain from this giant and the normal type, 213 seedlings were raised of which those from the giant type had 5·98 stems as compared with 4·07 in those from the normal type.

A few giant wheat plants totalling 50–60 grammes weight per plant were found in the F_2 from Ejima Shinriki x Shin-Nakacho.

---

* An extended summary of this paper is on file at the Bureau.

938. Nieves, R. 633.11:575.11.061.6:581.48
Herencia del color del grano en el trigo. **(Inheritance of grain colour in wheat).**
Jorn. Agron. Vet., B. Aires 1939 (1940) : 129–54.
Ratios of 63 red:1 white were obtained in the F_2 of crosses between Kanred and Florence and were confirmed in the F_3. Similar ratios were observed in the cross Lin Calél M.A. x Florence. Segregation of glume colour and grain colour in the cross 110 M.A. x Saratov 1197 gave ratios of 9:3:3:1.
In crosses of the red grained variety Klein Record with the red grained varieties Saratov 1196 and Saratov 1197, 15 red:1 white grained plants appeared in the F_2 of the former cross and 63:1 in the latter,
Genetical formulae in respect of grain colour are assigned to each of the varieties studied.

939. Vinogradova, E. I. 633.11:575.114
(A case of uniformity of F_2 hybrids from natural crosses).
Jarovizacija 1940 : No. 5 (32) : 124–25.
Certain chance hybrids between a red awnless wheat and an awned white eared wheat and artificial hybrids between a red awned and a white awnless gave a certain number of F_2 families in which no segregation occurred, while other F_2 families segregated in the usual way.

940. Mel'ničenko, Ja. S. and Tregubenko, M. Ja. 633.11:575.12:575.148
(Effectiveness of intravarietal crossing in winter wheat).
Selektsija i Semenovodstvo (Breeding and Seed Growing) 1940 : No. 10 : 9–13.
Data are given showing that seeds from intravarietal crossing are heavier, having a 1,000 corn weight from 0·69 to 4·22 grm. higher than selfed seeds. Germination was 1–2 days earlier and much more uniform, and the seedlings were larger and more vigorous; they survived freezing tests at −13° and −15° C. more successfully. Yield increases were obtained in the varieties Hostianum 0237 and Tenmark, 1·75 per ha. in the former and 1·64 in the latter; the varieties Krymka and Ukrainka gave insignificant yield increases, or even slight reductions.

941. Britten, E. J. and Thompson, W. P. 633.11:575.127.5:633.11 *Aegilops*:576.356.5:581.04
The artificial synthesis of a 42-chromosome wheat.
Science 1941 : **93** : p. 479.
F_1 seedlings from the cross *Triticum turgidum* x *Aegilops speltoides* were treated with colchicine and a considerable number of heads were found to have the doubled number of chromosomes. These heads with 42 chromosomes showed nearly normal chromosome behaviour (21 bivalents) and were fully fertile. Several offspring from these heads have been raised. They have a high fertility and resemble the *vulgare* group of wheats in their chromosome number and in some of their characters.

942. Tzitzin, N. V. 633.11:575.127.5:633.289
(Distant hybridization—the chief method of breeding).
Selektsija i Semenovodstvo (Breeding and Seed Growing) 1940 : No. 10 : 4–7.
A large collection of *Agropyron* forms comprising 1,486 specimens belonging to nearly 100 different species has been made as a basis for hybridization work with wheat. *A. glaucum* and *A. elongatum* have been crossed with almost all species of wheat and many thousands of hybrids are now under investigation. Experience has shown that the hybrids from different specific combinations differ in the number of back-crosses they require in order to produce offspring of the cultivated type. Sterility can often be overcome by pollinating with one of the fertile hybrids.
The progeny of spring forms of either wheat or *Agropyron* tends to contain a number of segregates of the spring type which do not therefore survive the winter; in order to avoid this the habit of the parent is now previously determined and only plants of the winter habit are used as parents. In this way it has been possible to produce whole generations consisting entirely of winter plants in crosses with both *A. glaucum* and *A. elongatum*, whereas in crosses

of spring forms of *A. glaucum* with spring wheat as many as 84% of spring forms occurred. Back-crosses too should be made only with winter forms when breeding for winter-hardiness. A number of hybrids of the winter type exceeding the standard Siberian varieties of wheat and rye in hardiness have already been obtained; four of these have given a 100% survival under conditions where Lutescens 0329 was killed off almost completely and the very hardy rye Omka gave a survival of 18–57%.

Annual spring forms suitable for steppe conditions have been produced in large numbers and 10 of them have exceeded the standard wheat varieties by 50–71%. Even greater differences have been recorded in drought years, many of the hybrids having inherited drought resistance from the *Agropyron* parent; others have inherited exceptional tolerance of excessive moisture and No. 22850 exceeded Caesium 0111 in 1938 by 251%. This hybrid is also resistant to bunt and smut, frost, lodging and shedding and distinguished by exceptionally high baking quality; it is being widely distributed in moist areas with a medium vegetation period. Where an early maturing form is required it is not suitable and crosses have been made to produce a wheat of similar type but earlier in maturity. Some of the F_2 hybrids are promising. Some of the more recent perennial segregates are regarded as promising, being superior to the earlier produced hybrids 34085 and 23086 in winter survival, yield and size of grain and at the same time distinguished by great resistance to diseases and other defects and by unusually high grain quality.

943. Tzitzin, N. 633.11:575.127.5:633.289

(Extending winter crops towards the eastern regions of the U.S.S.R. and producing new varieties of winter crops).

Sotsialističeskoe Sel'skoe Khozjaistvo (Socialistic Agriculture) Moscow 1940 : No. 10 : 48–61.

The growth conditions of Siberia and the possibilities of growing winter cereals there are discussed. One of the limiting factors is the lack of varieties capable of withstanding the rigorous climate, and the author attributes this absence of suitable material to the neglect of the ancient local strains, to which he is now devoting a special study.

Some of the *Triticum–Agropyron* hybrids with winter habit are much hardier than the varieties grown at present, such as Omka rye and Lutescens 0329 wheat.

The annual spring forms of the *Triticum-Agropyron* hybrids have exceeded the standard wheat varieties in the steppe zones by 50–71%, sometimes even more. This superiority is ascribed mainly to their great drought resistance. Some again are unusually tolerant of excessive moisture and No. 22850 in the very moist year 1938 gave a yield of 250% compared with Caesium 0111. The hybrids are also much more smut resistant, of exceptionally good baking quality, stand well and are free from shedding. The above hybrid No. 22850 is regarded as one of the most promising of all and has been crossed with wheat varieties to increase its earliness, in which respect some of the progeny plants are promising.

Another hybrid, named Skorospelka [Early Ripener] matures in 70–75 days, yields heavily, has large grains with a thousand corn weight of 65 grm. and is also excellent in baking quality. A number of perennial hybrids have now been produced; they are characterized by complete freedom from smut and resistance to a number of races of rust; some are very winter-hardy and one, E-141, is an exceptionally high yielder.

944. Makarovskii, A. F. 633.11:575.22:582

(Variation of morphological characters in wheat varieties).

Socialistic Grain Farming, Saratov 1941 : No. 1 : 162–70.

Further descriptions are given of the morphological characteristics of the spring wheat varieties Melanopus 067, Hordeiforme 101 and 027, Lutescens 1060 10 and 062, Hostianum 237, Erythrospermum 0341 and Caesium 0111, and the winter wheats Hybrid 0246, Stavropolka 0328, Ukrainka 0246, Stepnjačka 0496, and Kooperatorka 0194. Indications are given of the degree of variation of the characters and the influence on them of environmental factors.

945. Kihara, H. 633.11:576.356.52:581.162.3

(Formations of haploids by means of delayed pollination in *Triticum monococcum*).

Bot. Mag. Tokyo 1940 : **54** : 178–85.

A strain of *T. monococcum* which produced about 0·5% of haploids under normal conditions, gives rise to 13·7% of haploids when pollinated with X-rayed pollen. The effect of delayed

pollination with *T. aegilopoides* or hybrid *T. aegilopoides* x *monococcum* pollen is also to produce a high percentage of haploids, 20% of haploids being obtained from flowers pollinated 6 days after emasculation and 37·5% from 9 days after emasculation. No haploids were obtained from pollinations 5 days after emasculation. No seeds were obtained from emasculated florets which were left unpollinated. Microscopic examinations showed that egg cells may develop parthenogenetically into small haploid embryos and it is suggested that they will not develop further unless an endosperm is formed by the fusion of the polar nuclei and a sperm nucleus. Such a fusion presumably occurs in the delayed pollinations. Twin seedlings were never found in the progeny of *T. monococcum* on selfing or open pollination but they are found (0·78%) in the seedlings obtained from cross-pollination.

946. Eifrig, H. 633.11:581.192:578.088
Die Sichtbarmachung des mehligen Anteils bei Hartweizen. (**The demonstration of the starchy portion in hard wheat**).
Forschungsdienst 1941 : **11** : 187–89.

Vitreousness and starchiness in wheat are primarily varietal characters and they are important in the classification of varieties and of new productions of the breeder and also in economic practice. A method of determining the proportion of starch granules in wheat grains has been devised by steeping Turkish and German hard wheats (Rimpaus früher Bastard [— Rimpau's Early Hybrid]) in solutions of phenol, chloral hydrate, HCl or KOH. After 5–10 minutes of this treatment the starch granules turn yellow and can be counted.

947. Christiansen-Weniger, F. and Emre, E. 633.11:581.6:575
Ursachen für das Aufreten von "Dönme"-Körnern beim *Triticum durum* in Anatolien und Gegenmassnahmen. (**Causes of the occurrence of "Dönme" grains in *T. durum* in Anatolia and countermeasures**).
Züchter 1940 : **12** : 81–88.

Various climatic factors, types of soil and manures lead to the production of an increased proportion of the "Dönme" or mealy grains instead of the desired vitreous grains in *durum* wheat. Selection of resistant varieties is suggested as the most hopeful way to control the tendency (cf. also "Plant Breeding Abstracts", Vol. XI, Abst. 114). R.M.I.

948. Vajić, B. 633.11–1.524:664.641.016(49.7)
(**On the quality of some pedigree Slovenian wheats**).
Arhiv Minist. Poljopr. 1937 : **4** : No. 8 : 109–23.

This paper records part of the work carried out on certain wheats bred by the Banovina Seed Station at Beltinci.

Slovenian wheats are not of high quality, being mainly used locally and not for export. The most suitable criteria in judging such wheats and their chemical analysis, quality and absolute and hectolitre weight are discussed. The Pelshenke, Berliner and Brabender (farinograph) methods were used in estimating quality.

Considerable differences in quality were observed and the varieties 321 and 321 M were the best, followed by 831. Varieties 227 and C9 are distinctly inferior and not suitable for baking. The indexes for thousand corn weight and hectolitre weight were entirely satisfactory.

949. Weibel, R. O. and Quisenberry, K. S. 633.11-2.111-1.521.6
Field versus controlled freezing as a measure of cold resistance of winter wheat varieties.
J. Amer. Soc. Agron. 1941 : **33** : 336–43.

Results of controlled freezing tests were compared with cold resistance data obtained from reports of the Great Plains Uniform Winterhardiness Nurseries for thirty varieties of winter wheat. The freezing tests were made at four dates, November 15, December 5, December 15 and January 15. A high and significant correlation coefficient was obtained when the average survivals in the freezing tests were compared with the figures for field survival. The freezing tests made in December gave the best agreements with the field results. The seasonal trend of increased hardiness differed with different varieties.

950. Worzella, W. W. and
Cutler, G. H. 633.11–2.111–1.521.6
Factors affecting cold resistance in winter wheat.
J. Amer. Soc. Agron. 1941 : **33** : 221–30.

Freezing tests on field-hardened plants showed that they repeatedly acquire and lose their hardiness during the winter months, hardiness at a given time depending on the atmospheric temperatures prevailing several days prior to the test. Varieties differ in their degree of cold resistance, in ability to accumulate hardiness and to acquire the hardened condition earlier and to retain it later.

Cold resistance was greater in 5- to 15-leaf seedlings than in younger seedlings or in plants 10 to 12 inches tall. It was also greater on plants grown in soil of low or medium fertility than in those grown in highly fertile soil. Infestation with Hessian fly caused a large decrease in cold resistance.

The difference between air and soil temperature could be as great as 44° F. when there was a 3 to 5 inch layer of snow, but with an ice layer soil temperature followed air temperature much more closely.

951. Kuznetsov, A. V. 633.11–2.111–1.521.6:575.12
(Let us create suitable varieties of winter wheat for Siberia).
Jarovizacija 1940 : No. 5 (32) : 76–78.

Emasculated plants of the winter wheat Lutescens 0329 were left free to pollinate with surrounding plants of 23 different varieties, some winter and some spring forms, all of which flowered almost together. The seed was sown side by side with uncrossed seed. The winter was very severe but 96% of the hybrid seedlings survived, as compared with 56% of the uncrossed. The hybrid seedlings proved very uniform in time of earing and in type of ear and little or no segregation was observed.

952. 633.11–2.111–1.521.6:575.12
Ponomarenko, F. A. 633.14–2.111–1.521.6:575.12
(An experiment on breeding winter wheat and rye in the East).
Jarovizacija 1940 : No. 5 (32) : 69–75.

All the winter wheats introduced into Siberia as the most hardy have proved incapable of supporting the severe conditions of the winter and none of the breeding stations has yet succeeded in producing a wheat capable of being winter sown in Siberia. There exist however certain local strains that used to be grown more extensively than at present; in the few places where they are still grown they give yields in excess of those of spring wheat. Intravarietal crossing was carried out on one of these local strains in 1939. When the progeny of these crossed plants was compared with selfed progeny the crossed population was found to give 10% better winter survival. Since the original population contained a number of rye plants many of the crossed plants were wheat-rye hybrids, the proportion of these being much higher than the percentage of rye in the original population, evidently owing to selective fertilization; the hybrids were, moreover, not entirely sterile.

At a breeding station in the U.S.S.R. various forms of rye were sown in 1938, all of which were killed out except a few plants of a local rye Eravninskaja. These plants were transplanted and grown in proximity with a number of other rye varieties so as to intercross. Their seed when sown gave a population with a 97% survival. Similar results were obtained with the local rye Žitkinskaja and others.

953. 633.11–2.111–1.521.6:575.3
Kostjučenko, I. A. 633.14–2.111–1.521.6:575.3
(First results of work of the Siberian breeding stations with winter crops).
Jarovizacija 1940 : No. 5 (32) : 62–68.

Reference is made to escape plants found in an area where only spring wheat is grown and which when sown in spring proved to be mainly winter wheats; and to a population of the spring wheat Erythrospermum 0841 which when winter sown for three successive years consisted of 50% of plants which survived the winter in Siberia when the temperature fell to −30 to −40° C. Again, volunteer plants of the spring wheat Caesium 0111 were found in a field several years after this wheat had been grown there and had survived the winter quite successfully. Other cases are also quoted. Such plants are thought to be very promising as a

starting point for breeding hardy winter forms. The author even goes so far as to suggest that all the existing Siberian winter wheats owe their origin to such a process of conversion from volunteer spring forms, on account of the upheaval in their developmental stages caused by growing out of the usual seasons.

The best variety of winter rye is Bel'agačskaja, which is the product of selection over 8–10 years in the rigorous conditions of the Siberian climate; others are the various local ryes and selections from volunteer plants, all of which have proved superior to selections based on close breeding and commercial varieties.

The products of intravarietal crossing were found to be more hardy than selfed material.

954. Saks, A. I. 633.11–2.112–1.521.6:578.08

(On several direct methods of evaluating wheat varieties as regards their drought resistance).

Bull. Acad. Sci. U.R.S.S., Sér. Biol. 1941 : No. 1 : 163–75.

Descriptions are given of a drought plot made by surrounding the plot by a ditch to keep off running water and covering with a tarpaulin suspended on poles to keep off precipitation, the tarpaulin being removed during fine periods. Controls are grown on an open plot and on irrigated plots.

Drought determinations in pot experiments are also described; Wagner jars 20×20 cm. with 10 plants per jar are used in the case of wheat; the water content of the soil is adjusted by weight and allowed to fall to 3–4% for three days after which it is allowed to return to the optimum.

Yield data are given for 13 wheat varieties tested on the drought plot. The best yield was given by the standard Lutescens 062 but Lutescens 085 and 0318 also yielded well. The lowest among the soft wheats were Lutescens 0873 and 01272 and after vernalization also Lutescens 0847 and 0865. Among the *Triticum durum* varieties the best was invariably Hordeiforme 0228, Hordeiforme 0226 being also well above the standard; the lowest was Hordeiforme 010.

In breeding drought resistant varieties it is important to select forms that yield well also in good years. The varieties which gave the best performances both on the drought plot and the irrigated plot were Lutescens 062 and 085 and among the *T. durum* varieties Hordeiforme 0228. The same conclusion was reached from an analysis of the actual field results in the drought year 1939.

The results of the plot experiments agreed with the above or not according to the period at which the drought was applied. The same was true of the winter wheats, the results from the drought plot being in closer correspondence with the field results, where Hostianum 0237 was the most resistant.

Experiments to test the point showed that the rate at which the water content is reduced in plot experiments may entirely alter the results, and two varieties may be reversed in order of resistance according as to whether the water reduction is gradual or sudden. Gradual drying gave results corresponding more closely with the field reaction, provided it was applied at the developmental stage corresponding to that at which drought most commonly occurs in nature—which in the Čakino region is the stage between stem elongation and ear emergence. It is also thought a mistake to bring the plot plants to the wilting point, a water content of 3–4% of the free water content of the soil being nearer the conditions occurring during drought in the field.

955. Zablouda, G. V. 633.11–2.112–1.521.6:578.08

(A method for the comparative study of drought resistance in wheat).

Sovetskaja Botanika (Soviet Botany) 1940 : No. 5–6 : 154–66.

The development of the wheat plant is considered in six phases, as follows: (1) formation of leaves, (2) formation of spikelets, (3) formation of florets, (4) formation of reproductive cells, (5) formation of grain and (6) ripening of grain. The dates of the various phases differ according to the earliness or lateness of the variety and are given for the early variety Lutescens 062, the medium variety Erythrospermum 0841 and the late variety Milturum 0321. These phases were found to bear a different relation to the stages of tillering and shoot formation in the different varieties. Thus the three varieties may at a given date appear identical as regards external development and yet the floral organs in each may be at very different stages; they will thus be in a different state physiologically. The effects of drought were

found to be different in each of the developmental phases, the particular organs which are being formed at the time being most affected.
A true measure of the relative drought resistance of a number of varieties therefore can only be gained by comparing them at the same developmental stages of the reproductive organs. Of the three varieties examined, 0841 proved more resistant than 062 in the phases of spikelet and grain formation, but equal in the phase of floret and reproductive cell formation; 0321 was less resistant than the other two in the floret and reproductive cell phases, but equal to 062 in the phases of spikelet formation and of grain formation.
Pot experiments fail to take into account differences in root development, which affect drought resistance and are only truly manifested in field tests.

956. STANFORD, E. H. 633.11–2.451.3–1.521.6:575.116
A new factor for resistance to bunt, *Tilletia tritici*, linked with the Martin and Turkey factors.
J. Amer. Soc. Agron. 1941 : **33** : 559–68.
The wheat variety Rio (C.I.10061, a hard red winter wheat of the Turkey type) was crossed with Baart (a white wheat which is highly susceptible to bunt), with Turkey 3055 (which carries the Turkey factor only for resistance to bunt), with Selection 1403 (which carries the Hussar factor for resistance) and with Martin (which carries the Martin factor for resistance). The F_3 seed was inoculated with smut spores and the resulting plants were classified as smutted and non-smutted at harvest time. The results demonstrated the existence of a new factor for bunt resistance in Rio wheat. When present in the heterozygous condition this Rio factor permits about 50% of the plants to become infected. Factors present in Baart wheat were found to modify the action of the Rio factor so that a small percentage of plants become infected. The Rio factor is closely linked with the Turkey factor and more loosely linked with the Martin factor.

957. MURAV'EV, P. A. 633.11:664.641.016:575(47)
(An experiment on improving the grain quality of a winter wheat élite).
Selektsija i Semenovodstvo (Breeding and Seed Growing) 1940 : Nos. 11–12 : 40–42.
Comparisons of flour from Ukrainka and Hostianum 0237 showed that the data obtained immediately after harvest are just as reliable as those obtained on grain that has been kept for some months.
The method used in making the determinations is described. Observations on 350 families of Hostianum 0237 revealed marked differences between them and the best have been selected for multiplication and it is suggested that the same might with advantage be done in other varieties.

958. CLARK, J. A. 633.11:664.641.016:575(77.6)
Registration of improved wheat varieties, XIV.
J. Amer. Soc. Agron. 1941 : **33** : 254–56.
Two wheat varieties were approved for registration in 1940 by the American Society of Agronomy, Marmin (Registration No. 328) and Rival (Registration No. 329).
Marmin (C.I.11502) is derived from the cross Minturki (winter) x Marquis (spring) made at the Minnesota Agricultural Experiment Station in 1922. It is a winter wheat with glabrous, white glumes, awned spike and semi-hard to hard red kernels. Equal to Minturki in winter-hardiness and disease resistance, it was developed and distributed chiefly for improved quality; its yield is slightly less than that of Minturki.
Particulars of Rival have already appeared (cf. "Plant Breeding Abstracts", Vol. X, Abst. 115).

959. TENNBERG, F. and 633.11.0014(47.1)
JOKIHAARA, J. 633.11:664.641.016
Paikallisten kevätvehnän laatukokeiden tulokset vuosilta 1933–1937.
(The results of the local spring wheat tests carried out in the years 1933-1937).
Valt. Maatalousk. Julk. 1939 : No. 105 : Pp. 68.
Some hundreds of trials were carried out in Finland during 1933–37 with improved Finnish wheats as well as Swedish, American and Australian varieties.

Svalöf's Diamant gave the heaviest grain yields throughout the country, with the Finnish wheat Hopea a good second, followed by Ruskea and Sopu and finally by Pika II, Aurore and Garnet. The performance of the different varieties was analysed with regard to their reactions to locality, soil and climatic conditions and the yield of straw, etc.
Pika II, Hopea and Sopu showed some resistance to lodging and Aurore, too, had relatively thick stalks.
In baking quality, Garnet ranked first and Hopea and Sopu came next, while Diamant was superior to Ruskea and Pika II which was very poor owing to its weak gluten in spite of a comparatively large protein content.

OATS 633.13*

960. STANTON, T. R. 633.13:575(73)
Registration of varieties and strains of oats, X.
J. Amer. Soc. Agron. 1941 : **33** : 246–51.

In 1940 six oat varieties were approved for registration by the American Society of Agronomy under the following numbers: Fultex—92, Vicland—93, Ranger—94, Rustler—95, Huron—96 and Uton—97.
Fultex (C.I.3531) is an early to midseason, short, stiff-strawed variety of the red oat (*Avena byzantina*) group, being outstanding in this group because of its ability to stand long after maturity for combine harvesting. It is resistant to crown rust and smut. It has been tested in both autumn and spring sowings. It was selected at Texas Substation No. 6, Denton, from the bulked F_3 progeny of a cross between Fulghum and Victoria made at Arlington, Virginia.
Vicland (C.I.3611) is a yellow oat, early, with short fine straw of medium length, resistant to the now prevalent races of rusts and smuts occurring in the North Central States. The original cross, between Victoria and Richland was made at Arlington, Virginia. Selections were made at Aberdeen, Idaho and from the 33 selections sent to Madison, Wisconsin the variety was selected.
Ranger (C.I.3417) and Rustler (C.I.3754) were selected in Texas from bulk progenies of a cross made at Arlington, Virginia, between Nortex and Victoria. They are early to midseason varieties of the Red Rustproof type (*A. byzantina*), their special qualities being earliness, high yield and resistance to the races of crown rust and smut occurring in Texas. Winter growth habit was also an important factor in selecting them. The two varieties appear to be adapted to different parts of Texas.
Particulars of Huron have already appeared (cf. "Plant Breeding Abstracts", Vol. X, Abst. 751).
Uton (C.I.3141) is a rather tall, midseason, yellowish white variety of common oats with high yield and high resistance to the races of smuts prevalent in Utah and adjacent States. It originates from a cross between Markton and Swedish Select made at Aberdeen, Idaho; selections were sent to Logan, Utah, where reselections were made.

961. JONES, E. T. 633.13:575.127.2:575.11:575.242
A comparison of the segregation of wild *versus* normal or cultivated base in the grain of diploid, tetraploid and hexaploid species of oats.
Genetica 1940 : **22** : 419–34.

This is a paper read at the 7th International Congress of Genetics, Edinburgh, 1939. An abstract of it has already appeared (see "Plant Breeding Abstracts", Vol. XI, Abst. 534).
R. M. I.

962. ÅKERMAN, Å. and FRÖIER, K. 633.13:575.242:575.061.633
Studien über eine spontane *chlorina*—Mutation in *Avena sativa*. (**Studies on a spontaneous *chlorina* mutation in *Avena sativa*).**
Hereditas, Lund. 1941 : **27** : 371–401.

A *chlorina* mutation, discovered in Svalöf's Guldregn I (Golden Rain I) oats, behaves as a simple recessive in crosses with the parent strain. Although the *chlorina* plants are yellowish-green in colour and slow in development, they do reach maturity and can be propagated by

*See also Absts 930 and 933.

their own seeds. Small deviations from the expected 3: 1 ratios in some F_2's are discussed in relation to environmental factors, especially frit fly attack.
Crosses were also made between five oat strains and the *chlorina* plants from Golden Rain I. The F_2 segregations were of three types—3:1, 15:1 and 63:1. The 63:1 segregations were checked in F_3's. These results indicate that there are three polymeric factors (*Chlor* 1, *Chlor* 2 and *Chlor* 3) which in the recessive state produce the *chlorina* character. Plants of the genetical constitution *Chlor* 1 *chlor* 1 *Chlor* 2 *chlor* 2 *Chlor* 3 *chlor* 3 are fully green. The F_2 results show that Abed's Nova oats and strain 0101 have one *Chlor* factor, Svalöf's Segerhavre (Victory) has two and Svalöf's Klockhavre II (Bell II) and Hede oats have three *Chlor* factors. In the last part of the paper the very low frequencies of chlorophyll mutations found in oats and wheat are discussed. It is suggested that this is not due to the hexaploid constitution of cultivated oats and wheat since other mutations do occur more frequently, e.g. black to grey or white kernels in oats with a frequency of 1 in 200. Also the *chlorina* forms in oats have been shown to be monofactorial in some strains.

963. Tingey, D. C.,
Woodward, R. W. and
Stanton, T. R. 633.13–2.451.3–1.521.6:575
Uton. A new high-yielding white oat resistant to loose and covered smuts.
Bull. Utah Agric. Exp. Sta. 1941 : No. 296 : Pp. 15.
The breeding and performance of Uton in described (cf. also Abst. 960).

RYE 633.14*

964. Aust, S. and
Ossent, H. P. 633.14:575:664.641.016:578.08
Qualitätszüchtung beim Roggen. (**Breeding for quality in rye**).
Züchter 1941 : **13** : 78–84.
The growing importance of rye in meeting German economic needs has led to active research on quality in this cereal in addition to yield and other important features of the grain and resistance to lodging, drought and disease.
Experiments in 1935 with selected inbred lines have indicated that such lines may differ widely in their crude protein content and that these differences must depend on hereditary factors.
In 1937 these self-fertile lines were therefore tested for their baking quality with Brabender and Müller's amylograph, slightly adapted by the authors for dealing with very small amounts of grain. Three possible techniques with this apparatus and their advantages and limitations are described: Brabender's, Sholz's and a short method devised by the authors. The results showed wide and hereditary differences in the starch characteristics in the individual lines.
Results for a three-year period showed that the starch characteristics too were genetically conditioned in the individual strains and that 22% of all the strains showed in their viscosity charts the desirable intermediate range, with maxima lying between 450 and 900 units. These experiments were further elaborated and verified by maltose determinations, and baking experiments later on are also contemplated. Of the experimental ryes 38% had optimum values for maltose content lying between 24–35%. There is not necessarily a correlation between good maltose content and starch viscosity values; but by rigid selection for these characteristics 13 very promising self-fertile strains were obtained which were suitable for use in breeding for quality combined with yield. These strains have also been found to have a relatively high protein content, at least 5·68% higher than the Petkus standard, and at best nearly double its crude protein content. In most of them the grain is very small but four strains have larger grains than Petkus and three have a 1,000 corn weight of 40–41·6 grm. Yield trials are to be made later with a view to hybridization to obtain combinations of good quality and yield.
The determinations of the maltose and starch characteristics provide a useful measure of the amount of sprouting and such data on capacity for maltose formation could be used by the breeder in his search in laboratory experiments for types resistant to sprouting. In preliminary investigations it has been found that in 96% of cases the resistance of strains selected for

*See also Absts 952 and 953.

this characteristic and tested in the greenhouse was subsequently confirmed by the results of maltose determinations.

965. 633.14:575.14
Khačaturov, S. P. 633.14:581.162.3
(The possibility of planned improvement of the breed in rye seeds).
Jarovizacija 1940 : No. 5 (32) : 35–47.

A number of rye varieties were grown in neighbouring plots. In each plot isolators were put on a group of plants at the time of flowering to ensure pollination within the parent; about 50–200 ears were contained in each isolator. A similar number of ears from open pollinated plants were taken for comparison. Also, at the union of each two varieties isolators were arranged so as to contain ears of both varieties and so interpollinate.

Isolators containing varying numbers of ears, from 200 to 25 and less, showed that when more than 25 ears were included no deleterious effects from inbreeding were detectable.

The 1,000 corn wheat of "original" seed of Vjatka rye was 22·9 grm., that of the open pollination plots 28·8 grm., that from plants in the isolator 23·9 and that from the crossed plants in the isolator 25·1 25·8 grm. The open pollination has thus produced the best grain of all. Similarly in respect of yield per ear, the open pollinated ears yielded up to 1 grm. each while all other variants yielded 0·5 grm. or less. The variety Avantgarde gave 37% more yield from open pollinated plants than from "original" seed and other varieties reacted similarly; all gave higher yields from open pollination and produced larger grains. No sign of deterioration as a result of open pollination could be detected. The advantage of this type of pollination is ascribed to the selective action of the gametes at the time of fertilization and the wider the range of selection the better the results were found to be.

When the seed from the different variants was sown, the progeny from the isolated plants in many varieties proved less hardy than that from open pollination or from crossing; and again the highest yield was given by the progeny from open pollination. The type of plant remained very much the same and no marked deviations from the maternal type were observed. This was particularly noticeable in experiments with spring rye. This again is ascribed to selective fertilization.

966. Borisenko, S. F. 633.14:575.22
(Family analysis in the work of breeding and seed production with rye).
Jarovizacija 1940 : No. 5 (32) : 57–61.

Families derived from different plants showed clear differences, in such characters as length of ear, number of grains per ear, density, 1,000 corn weight, etc., though within each family these characters were usually very uniform. Observations during the growing period revealed differences in habit, colour, vigour and time of maturity; also in standing capacity.

Certain families showed more variation from plant to plant and in these families the plants themselves were found to be not uniform, differences being detected between the individual tillers.

967. Mitkov, T. 633.14:575.42(49.7)
(Preliminary report on the varieties of rye recently produced at the Sadovo Experiment Station).
Zemledelie, Sofia 1938 : **42** : 101–03.

Petkus rye was formerly shown by K. Malkov's experiment to be, for Bulgarian conditions, the most suitable of the German varieties tested, but local mixed populations in the country have provided promising material for obtaining by individual and mass selection a rye with good quality and yield and resistant to the climatic conditions.

In 1935 four strains were chosen and have been undergoing variety trials with Petkus as the standard; and strain No. 59 of the Ruse Station was also included. The results for three years show that strain No. 362, which ranked first, Mass Selection 1 and strain 41 all exceeded Petkus and the other varieties in yield. No. 362 was also very good in quality and surpassed all its competitors in crude protein content.

In general, the local varieties contain twice as much crude protein as the original Petkus.

The families of rye that have been undergoing selection also have a high protein content and promise to be of superior baking quality. Seed is to be raised from this strain for distribution.

The local ryes have proved superior to Petkus under Bulgarian conditions owing to their ripening earlier and thereby avoiding rust infection.
Systematic breeding of such local forms should prove profitable.

968. Müntzing, A. and Prakken, R. 633.14:576.356:576.354.4
Chromosomal aberrations in rye populations.
Hereditas, Lund 1941 : **27** : 273–308.

Meiosis was examined in the pollen mother cells of 167 rye plants from normal populations of two varieties. Of the 167 plants examined 98 were found to be quite regular, 53 showed slight irregularities, 5 were heterozygous for inversions, 6 had segmental interchanges, 3 had extra chromosomes or fragments, 1 showed cytomixis and finally 1 plant was a tetraploid-diploid chimaera. One of the plants with segmental interchange was also heterozygous for an inversion and one of the plants with chromosome fragments showed cytomixis in some cells. The slight cytological irregularities observed include the occurrence of non-conjunction at first metaphase and difficulties in separation at first anaphase.

969. Aust, S. 633.14–1.557:581.165:578.08
Erhöhte Saatgutgewinnung bei Roggen durch vegetative Vermehrung. (**Increased seed production in rye by vegetative propagation**).
Züchter 1941 : **13** : 84–87.

A method is described whereby rye plants from valuable breeding strains can be divided up into several portions from which plants can be grown for seed. In the experiments here recorded from 8 strains from which 31 plants for vegetative propagation were obtained a total of 620 plants was finally raised. The highest yield from one grain, namely 147 grm. of seed, was obtained from the hybrid strain Ks. 1342; this strain too showed the highest number of grains (raised from one grain) namely 4,200, calculated from the 1,000 corn weight. The corresponding average figures for the experimental material as a whole were 77·3 grm. and 2,141 grains.
The value of the method to the breeder in accelerating seed production for large scale cultural experiments is stressed.

970. Pehl, P. 633.14.0014:575"793"(43)
Ermittlung früh schnittreifer Futterroggen für den Zwischenfruchtbau. (**Searching for catch crop ryes for fodder that are ready for cutting early**).
Züchter 1941 : **13** : 59–63.

An account of field trials in 1939–40 with 62 German and foreign ryes and the so-called Staudenroggen Limburgerhof as control. As no variety was found that was ready for cutting earlier than the control, the solution of the problem may possibly be found in breeding—especially as most of the ryes tested seemed either not to have undergone thorough selection or to be land varieties.

MAIZE 633.15

971. 633.15:575–181:581.49
633.15:575"793"
Tavčar, A. 633.15–1.557
Visina biljaka, doba cvatnje i prirod zrna kod roditelja i F_1 generacije u odnosu napram broju i duljini lisnih puči kod kukuruza. (**Plant height, time of flowering and yield of grain in the parents and F_1 generation in relation to the number and length of stomata in maize**).
Arhiv Minist. Poljopr. 1938 : **5** : No. 11 : 47–61.

The introduction deals with Kiesselbach's findings on the nature of the difference in size of plant and stomata in hybrids showing heterosis.
The experimental maize plants were obtained by five years of artificial self-pollination. The number and size of stomata was determined in 40 F_1 plants—of which 20 showed heterosis, 10 were intermediate, 5 were equal in height to the taller parent and 5 equal to the shorter parent. Yields and earliness were also studied.
The results showed (1) that a certain relationship exists between number of stomata and size

of their aperture on the one hand and plant height and grain yield on the other in the F_1 generations as compared with the parent genotypes; and (2) that grain yield was higher than the higher yielding parent in two F_1s and in three intermediate between the high and low yielding parents.

Parallel investigations carried out on 14 day old plants showed that these relationships were approximately the same in both young and mature plants.

The plant height was from 2 to 6 cm. higher than the shorter parent and 16 to 34 cm. lower than the higher parent. The panicles flowered 1 to 3 days later than the early parent in four F_1s and at the same time in one F_1.

F_1 plants were sown between the plots of the two parents.

From the middle of each row 5 equally developed plants were taken and the leaf bearing the uppermost cob was removed; from the middle of each leaf a small piece (5 cm. long) was cut out and placed in absolute alcohol to extract the chlorophyll after which the material was prepared for microscopic examination. Twenty counts and measurements of stomata were made from each leaf, making a total of 400 observations on each parent and F_1 generation.

The first group consisted of plants taller than the parents, the second group contained those of intermediate size, the third group plants equal to the taller parent, and the fourth group those equal to the smaller parent.

The approximate transpiration area of the upper and lower surface of leaf was also calculated; also the time from germination to flowering. The yields are given both as total yields and as percentages of the lower yielding parents.

In the first group in all F_1 plants the number of stomata per unit area on the upper and lower side of the leaf is higher than that of the parents and the length of the aperture is smaller. The products of the number per unit surface and length of aperture (as an approximate measure of transpiration surface) are higher in these F_1s in both upper and lower surfaces as compared with the parents. The sum of these products is also higher.

The height of the plant for individual F_1 generations averages from 9–65 cm. higher than the taller parent.

The F_1 plants flowered on an average 1·9 days earlier than the parents. Grain yields were on the average 0·045–0·257 kg. more than the higher yielding parent.

The F_1 generations of the second group were intermediate in number of stomata on both upper and lower leaf surfaces. Length of stomatal aperture on both leaf surfaces was also intermediate.

Out of 10 F_1 generations of this group, the product of the number of stomata and length of aperture on the upper surface of the leaf was intermediate in six, less than the parents in three, and higher in one. For the lower surface it was intermediate in four generations, less in three and higher in three. The sum of the products for the upper surfaces was intermediate in six, higher in two, and less in two.

The plant height was on an average 5–28 cm. less than the taller parent.

The F_1 flowered from 0 to 28 days later than the early parent. Five F_1 generations flowered earlier, two later and three simultaneously with the late parent.

The yield of grain per plant in five F_1 generations was higher and in five less than the higher yielding parent.

In the third group where the plants of the F_1 are equal in height to the taller parent, the stomatal number on the upper and lower surfaces was generally equal to that of the taller parent. The length of the stomatal aperture of the upper and lower surface in the five F_1 generations examined almost equalled that of the taller parent. The same holds for the products of the number and length of the stomatal apertures on both surfaces and the sum of their products.

The F_1 plants are on the average 2–4 cm. shorter than the higher parent and 23·39 higher than the lower parent.

The panicles flowered in two F_1 generations 1–2 days earlier and in three F_1 generations 3–7 days later than the early parent.

Yield of grain per plant was in four F_1s 0·005–0·048 kg. higher, and in one 0·03 kg. less than the more productive parent.

In the fourth group the F_1 generations comprise plants mainly equal to the shorter parent in height. Their stomatal number and apertures are approximately the same as in the shorter parent. The products of number and length for both surfaces in the F_1s are approximately equal to those of the shorter parent; the same is true for the sum of the products.

972. Ionescu, M. V.,
Popescu, O. G.,
Sluşanschi, H. and
Gaal, L. 633.15:575.1:581.192
Contributiuni la studiul chimic al porumburilor Românești (recoltele 1936 şi 1937). (**Contribution to the chemical study of the Rumanian maize varieties of the harvest of 1936 and 1937**).
Anal. Inst. Cerc. Agron. Român. 1938 (1939) : **10** : 282–357.

Ionescu, M. V.,
Popescu, O.,
Sluşanschi, H. and
Gaal, L.
Contributiuni la studiul chimic al porumburilor Românești recolta 1938. (**Contribution to the chemical study of the Rumanian maize varieties of the harvest of 1938**).
Ibid. 1939 (1940) : **11** : 266–313.

Tabular data are given on the protein, starch and fat content of the principal Rumanian maize varieties from different districts. The varieties were found to differ in the amount and proportions of these substances contained in the grain. Protein content is correlated negatively with starch content and positively with percentage of crude fats. The varieties fall therefore into three classes, (1) starchy, (2) albuminous and fatty, (3) intermediate. The varieties Românesc, Dinte de cal (Horse tooth), and Hăngănesc belong to the first group, Portocaliu and Cincantin to the second and Moldovenesc and Ardelenesc to the third. Since starch constitutes two-thirds of the nutritive constituents of the grain a high starch content is thought to be the most desirable quality a variety can possess. There is an inverse relationship between content of cellulose and hemicelluloses and size of grain and a variety with large grains is therefore also desirable.
Crossing in almost all cases increased the starch content, whilst the protein content either diminished or remained the same; the starch content was almost invariably above the parental mean and the protein below. The percentage of these constituents depended not only on the variety but on the locality in which it was grown; growing in the regions defined as typical for the varieties concerned did not invariably produce the highest percentages of the above constituents: both pure varieties and their hybrids regularly showed higher percentages when grown in areas other than the typical.

973. Pavlov, B. Ja. 633.15:575.12
(**Further notes on deterioration from cross breeding in maize**).
Jarovizacija 1940 : No 5 (32) : 127–28.

The method of seed production used previously consisted of isolating a cob from one plant with a tassel from another in one bag; it thus amounted to close breeding and has resulted in marked loss of yield in all varieties. Pollination is now effected with a mixture of pollen from a number of different plants. No bag is applied, the pollinated cobs being left quite free.

974. Stringfield, G. H. 633.15:575.12(77.1)
Hybrid corn in Ohio—historical notes.
Bi-m. Bull. Ohio Agric. Exp. Sta. 1941 : **26** : No. 208 : 3–5.

The history of hybrid maize is briefly outlined. In Ohio inbreeding experiments were begun at the State University in 1920 and at the Experiment Station in 1924, the work being combined in 1929. Commercial seed production of hybrids was started in 1933 and hybrids are now grown on more than 1,000,000 acres in Ohio. The seed is inspected and certified by the Ohio Seed Improvement Association.
Some of the prejudices shown by farmers to hybrid maize are described.

975. Harvey, P. H. 633.15:575.125(75.6)
Preliminary results of the utilization of Corn Belt inbreds in the N.C. corn breeding program.
Proc. 42nd Annu. Conv. Ass. Sth. Agric. Wkrs, Atlanta, Ga., February 5–7, 1941 : 96–97.

Hybrids from Corn Belt inbreds have proved to be quite unadapted to North Carolina

conditions. Several ways of utilizing the Corn Belt inbreds for producing varieties from North Carolina are being tried. These include multiple top crosses and inbreeding from F_1 hybrids of Corn Belt lines and local strains.

976. Molotkovski, G. Ch. 633.15:575.3:577.8
(The question of transforming the nature of maize).
Sovetskaja Botanika (Soviet Botany) 1940 : No. 5–6 : 325–31.
Germinating seeds of the local maize Žitomirskaja were treated with aqueous solutions of ethylene of varying concentrations. Various floral anomalies, such as the production of male flowers on the female inflorescence or female flowers on the male, were observed in the treated plants, affecting as many as 32% of the plants in the treatment with solutions of 1 in 100; however, 6% of the controls, treated with tap water only, showed similar anomalies too.
The experiment was repeated the following year with the same variety and a number of others. The greatest proportion of anomalies resulted from the treatment with solutions of 1 in 1,000, which gave 31%, as against 12% in the controls.
The grains produced on the male inflorescence the previous year were subjected to similar treatment; in this case the controls contained 30% of anomalies and those treated with 1:1,000 solution contained 70%.
The reaction of a number of other varieties to the same treatment was similar. It is thought that the conditions of the region of Žitomir where the experiments were carried out are in some way conducive to sex reversal. Decapitation also tended to increase the percentage of anomalies.

977. Longley, A. E. 633.15:576.312.34
Chromosome morphology in maize and its relatives.
Bot. Rev. 1941 : **7** : 263–89.
Species of *Tripsacum*, *Euchlaena* and *Zea* are considered in the review. The topics discussed include chromosome lengths, the position and shape of the centromeres, chromosome knobs, the nucleolus-organizing body and other morphological features (e.g. darkly staining areas and chromomeres). The bearing of chromosome morphology on taxonomic relationships is also considered.

978. Longley, A. E. 633.15:576.312.34
Knob positions on teosinte chromosomes.
J. Agric. Res. 1941 : **62** : 401–13.
Studies were made on the meiotic prophase chromosomes of a number of races of teosinte (*Euchlaena mexicana*). The chromosomes of teosinte were found to be very similar to their homologues in maize in chromosome length and position of centromere. The positions and numbers of chromosome knobs are, however, different. All knobs in teosinte are terminal. The different teosintes differed in the mean number of knobs per nucleus, in the amount of knob forming substance per nucleus and in the frequencies with which knobs are formed on certain chromosomes. The results indicate that teosintes of northern Guatemala are slightly more like maize than those from southern Guatemala, while perennial teosinte from Mexico is most closely related to maize.

979. McClintock, B. 633.15:576.356.2:581.483:581.481
The stability of broken ends of chromosomes in *Zea mays*.
Genetics 1941 : **26** : 234–82.
A preliminary account of these extensive studies has already been reviewed in "Plant Breeding Abstracts", Vol. X, Abst. 137. A wealth of evidence is presented to support the conclusion that the breakage-fusion-bridge cycle continues in the gametophytic generation and in the endosperm but is ended permanently in the sporophyte, where the broken end behaves as a normal end.

980. Hume, A. N. 633.15:581.162.3:578.08
A possible new method for the control of pollination of corn.
J. Amer. Soc. Agron. 1941 : **33** : 265–66.
The new method consists in the use of "overall bags" of heavy muslin covering the plant from the top down to the silks. It is claimed that the time needed is half that for the methods commonly used.

981. Ionescu, M. V. and
Sluşanschi, H. 633.15:581.192:578.08
Contribuţiuni la studiul determinării amidonului în cereale. Nota II-a : Relaţii intre conţinutul in amidon şi materile celulozice. (**Contributions to the study of the starch determination in cereals. Note II. Relationship between starch content and cellulose materials**).
Anal. Inst. Cerc. Agron. Român. 1938 (1939) : **10** : 358–76.
The saccharification method of Liebermann-Lintner-König-Sutthoff gave results not in agreement with the actual starch contents of a number of maize varieties and their hybrids. The error was greater in the varieties with the lower starch contents and the smaller grains where the cellulose and hemicellulose content is relatively higher. The errors are not however sufficiently regular to permit of a correction being made. The only way of making a correction is by determination of the pentosans as in the original König-Sutthoff method.

982. Roberts, E. and
Hoener, I. R. 633.15:581.6
Causes of preferences exhibited by animals for certain inbred lines of corn.
J. Amer. Soc. Agron. 1941 : **33** : 448–53.
With a choice of ground maize of the two inbred lines, Wisconsin R_3 and Illinois 90 and of the hybrid R_3 x 90 (F_2), rats showed the greatest preference for R_3, an intermediate preference for the hybrid, and least for 90. This preference was not associated with odour, the type of seed coat, or carotin content. The rats showed a greater preference for R_3 x 90 (F_1) than for 90 x R_3 (F_1). This suggests that the cause of the preference may be located in the endosperm. Rats gain as much weight when eating 90 as when eating R_3.

983. Saboe, L. C. and
Hayes, H. K. 633.15–2.451.2–1.521.6:575.116.1:576.356.2
Genetic studies of reactions to smut and of firing in maize by means of chromosomal translocations.
J. Amer. Soc. Agron. 1941 : **33** : 463–70.
Two smut-resistant lines of maize, one selected from Minnesota No. 13 and the other from Rustler, were crossed with several different smut-susceptible interchange lines. The F_1 hybrids were then back-crossed to the smut-resistant lines and in the back-cross progenies the linkage relations between the smut reactions and the points of interchanges were studied. In the Minnesota No. 13 crosses the results suggest that at least three factor pairs or linked groups of factors are responsible for the smut reaction—one possibly located in the long arm of chromosome 7, one in the short arm of chromosome 6, and one in the long arm of chromosome 8. In the Rustler crosses there were also indications of three factor pairs for the smut reaction, one possibly located in the short arm of chromosome 4, one either in the long arm of chromosome 3 or in the long arm of chromosome 5, and another either in the long arm of chromosome 8 or somewhere in chromosome 5. The normal Rustler parent also carried the firing character. The back-cross association results between the firing character and semi-sterility suggest that three factors are responsible for the firing character. These factors are located as follows—one in the short arm of chromosome 4, another in the long arm of chromosome 7, and the third either in the long arm of chromosome 2 or in the long arm of chromosome 4.

984. Pepper, B. B. and
Garrison, C. S. 633.15–2.7–1.521.6
The performance of hybrid field corns under European corn borer conditions in New Jersey.
J. Econ. Ent. 1941 : **34** : 281–84.
The European corn borer (*Pyrausta nubilalis*) populations of eight hybrids and open pollinated varieties of maize were investigated. The results showed that N.J. Hybrid No. 2 has a definite resistance to the borer. Hybrid R_1XHy also has some resistance. N.J. Hybrid No. 4 can tolerate a certain number of borers without a marked reduction in yield because of its large stalk. There was a definite correlation between stem hardness and borer populations, the harder stems having lower populations.

985. Poole, C. F. ,633.15–2.7–1.521.6:519.241.1
Corn earworm resistance and plant characters.
Proc. Amer. Soc. Hort. Sci. 1940 : **38** : 605–09.
From the correlation studies here presented it is concluded that resistance to corn earworm (*Heliothis armigera* Hbn.) is not causally related to any of the following characters: extension of husk, time to tasseling or silking, plant height, ear weight, ear length or number of husks. The widely held belief that a long husk extension or a heavy husk covering confers earworm resistance has its basis, it is suggested, in the huskiness of the southern dent corns from which practically all the resistant varieties tested earlier are derived, either directly or by hybridization with northern sweet corns.

986. Blanchard, R. A.,
Bigger, J. H. and
Snelling, R. O. 633.15–2.7–1.521.6:575.14
Resistance of corn strains to the corn ear worm.
J. Amer. Soc. Agron. 1941 : **33** : 344–50.
The damage caused by corn ear worm (*Heliothis armigera*) to 51 inbred lines and 61 single crosses of maize was studied. Artificial infestations with ear worm larvae were made and natural infestations also occurred. The data indicate that resistance to corn ear worm is inherited. Some inbred lines tend to be consistently resistant whereas others are definitely susceptible. Single crosses are in general less severely damaged than inbred lines. Some inbred lines transmitted a high degree of resistance even when combined in single crosses with susceptible lines. The combination of two susceptible lines usually resulted in a susceptible single cross but in one case a resistant single cross resulted from such a combination.

BARLEY 633.16*

987. 633.16:575(73)
Hayes, H. K.
Barley varieties registered, VI.
J. Amer. Soc. Agron. 1941 : **33** : 252–54.
In 1940 three varieties of barley were approved for registration by the American Society of Agronomy under the following numbers: Wintex—9, Compana—10 and Barbless—11.
Wintex is intermediate in habit between winter and spring barley and is suitable for autumn or spring sowing. It is a six-rowed variety which in north-central Texas has proved about as hardy as Tennessee Winter, though less hardy in other tests. Superior characters are high yield, high test weight, strong straw and high carrying capacity when used for autumn and winter pasture. It was selected at Denton, Texas in 1931 from a strain named Smith, by I. M. Atkins.
Compana (C.I.5438) is a two-rowed, covered, semi-smooth-awned barley with a short, erect habit of growth. It is valuable for its high yield, early maturity, resistance to drought and greater resistance to grasshopper attack than Horn and Trebi. Selected from a composite cross made by H. V. Harlan in 1920 it is the product of co-operation between the Bureau of Plant Industry, United States Department of Agriculture, and the Montana Agricultural Experiment Station.
Barbless (C.I.5105) is a lax, six-rowed, covered, smooth-awned barley resistant to stripe disease (*Helminthosporium gramineum*) with high yield, maturing four or five days later than Oderbrucker. First distributed by the Wisconsin Agricultural Experiment Station in 1929, it has been grown extensively in the north central barley area under the name Wisconsin No. 38 and though lower than Oderbrucker in malting quality it is the main variety used for that purpose in Wisconsin and Minnesota. It was selected by B. D. Leith from the cross Oderbrucker x Lion.

988. Tokhtuev, A. V. 633.16:575"793"
(Breeding barley for yield and earliness by the hybridization method).
Selektsija i Semenovodstvo (Breeding and Seed Growing) 1940 : Nos. 11–12 : 13–16.
The variety Wiener, otherwise excellent, is somewhat too late for the Leningrad district.

*See also Abst. 933.

The variety "DS865/3—erectum" produced by the breeding station at Pushkin (Detskoe Selo) is equal or superior to Wiener in yield in favourable years and has stronger straw and larger grain. This variety therefore has been crossed with a number of standard varieties and with forms of distant geographical origin. The early maturing segregates were almost exclusively lower in yield than the later maturing parent. The majority of the F_3 segregates were intermediate in both yield and time of maturity. Some few were however equal to the earlier parent in earliness and above the better parent in yield—e.g. Line 53h409—pallidum from DS.657/1 pallidum x Kruglik 021; in tillering capacity it is intermediate between its parents but in yield per ear surpasses both of them; its total yield was 11·5% above that of the better parent. Some of the hybrids between spring and autumn barleys ripened even earlier than the spring form but were not equal to it in yield.

Data are given for certain constant F_4 lines selected from the best F_3 plants; Line 74h551,1 parallelum, from the cross DS657/1 x DS865 3 matures 6 days earlier than the later parent 865/3 and outyields it by 18%; its yield is 40-51% above that of Wiener. The hybrid has combined the high tillering of the one parent with the large ear of the other; in fact its yield per ear is higher than in either parent, since it is a 6-row form with denser ears and larger grains than the 6-row parent. Its straw is also stronger than Wiener and altogether this line is considered very promising.

Several other promising lines are described, including certain naked forms from crosses with a naked Chinese barley.

The conclusion is reached that the best way of attaining the desired results is to cross early with late forms or spring with autumn, or two forms differing in their yield components. Crossing between geographically different races has not been particularly successful, though the experiments were not carried out on a large enough scale to draw final conclusions on this point.

989. Gustafsson, Å. 633.16:575.243:537.531

Mutation experiments in barley.

Hereditas, Lund **1941** : **27** : 225–42.

The production of mutations in barley by X-rays and the types of mutation induced are discussed under the following headings—the proportionality of dosage and mutation frequency, determined and directed mutability, and vital mutations. It is suggested that the direct proportionality between induced mutations and dosage in barley is a "pseudophenomenon." The occurrence under different conditions of the types of chlorophyll mutations—*albina, xantha, alboviridis, alboxantha, viridis* and *tigrina* are discussed in the second part of the paper. The results seem to indicate that certain types of mutations occur much more frequently in certain treatments. Among the "vital mutations" which have been found are *erectoid* mutations (the treated variety is a typical *nutans* line), forms in which the glumes were lemma-like (see "Plant Breeding Abstracts", Vol. XI, Abst. 139), two winter barley-like mutations (one of these types is so late that it hardly has time to mature), six-row mutations (though these may be due to mechanical interference), mutations involving changes in kernel size and colour, mutations involving date of maturity and mutations in respect of straw height and straw stiffness. The relations of these mutations to the sterilities of the X_1 lines are also discussed.

990. Gelin, O. E. V. 633.16:575.243:537.531:576.356

The cytological effect of different seed-treatments in X-ray barley.

Hereditas, Lund **1941** : **27** : 209–19.

Seeds of Golden Barley of the following types—containing 10% water; containing 15% water; soaked for 23 hours in water and soaked for 23 hours in 0·01% heteroauxin solution —were irradiated with X-rays. After irradiation the seeds were germinated and the radicles were fixed as soon as the roots had ruptured the coleorhiza. Cytological disturbances (chromosome fragments and bridges) were counted in longitudinal sections of the roots. Seeds containing 10% water show 12·7% disturbed divisions, seeds containing 15% water 28·0%, seeds soaked in water 53·8% and seeds soaked in heteroauxin solution 51·0% disturbances. The chromosome aberrations show a random distribution in different parts of the roots but the cells that divide first show the highest frequencies of abnormalities. Bridges occur in one-third of the cells showing disturbances. The same proportionality existing between the percentages of cytological abnormalities in the different treatments is also found in the frequency of mutations in the different treatments.

991. Gustafsson, Å. 633.16:575.243:631.557
Preliminary yield experiments with ten induced mutations in barley.
Hereditas, Lund 1941 : **27** : 337–59.

Yield experiments were carried out with ten induced mutations in barley, with their mother strain (Golden Barley) and with Maja barley (the highest yielding variety cultivated in Scandinavia). The induced mutations included five *erectoides* types, a form with lemma-like glumes, a late mutation, a leaf colour mutation and two types with stronger straw than the parent strain (see Abst. 989 for the origin of these mutations). Seven out of the ten mutations had lower yields than the parent strain, but three equalled or surpassed the mother strain. One or perhaps two mutations had a yield as high as Maja. *Erectoides* 3 gave the highest yield (11·7% higher than that of Golden barley). The 1,000 grain weight, protein and starch contents and germination ripeness were also studied. There was a pronounced negative correlation between yield and protein content.

992. Middleton, G. K. and
Chapman, W. H. 633.16:575.41:581.46:631.557
An association of smooth-awnedness and spring growth habit in barley strains.
J. Amer. Soc. Agron. 1941 : **33** : 361–66.

Census studies were made on the F_3 to F_5 and F_9 to F_{13} of a composite barley hybrid No. C.I. 5461. Twenty-eight varieties were used in the preparation of the composite, 17 being six-row rough-awned types, 7 two-row rough-awned, 3 six-row smooth-awned and 1 six-row hooded. The composite was sown each year in the autumn. The results show that the percentage of smooth-awned, hooded and two-rowed types in the composite decrease rather rapidly from generation to generation, the smooth-awned types decreasing most rapidly. Yield trials with bulked segregates showed that the six-row rough-awned types outyield all others. A cross between rough and smooth-awned segregates from the composite was made. In the F_3 lines of this cross rough-awned lines out-yielded the smooth-awned ones. Some F_3 lines from this cross were also sown in the spring. The data showed a very clear relationship between spring growth habit and smoothness of awn. Thus on July 19 it was observed that 29 out of 33 rough-awned families were still not fully headed as compared with only 5 of the 34 smooth-awned families.

993. Kravchenko, J. M. and
Khodkov, L. E. 633.16:581.46
(Cases of branching of the barley ear and stalk).
J. Bot. Acad. Sci. Ukraine 1940 : **1** : 275–77.

Branched ears were found in a field of 4-rowed barley. The branched ears yielded an average of 89 grains each as compared with 63 for normal ears; the grains however were smaller. Grains from the branched ears gave normal unbranched offspring. The same phenomenon was also observed in an F_2 of a cross. In this case the occurrence of plants with branched ears is ascribed to the high temperature of the greenhouse.

994. Becker. 633.16–1.524:575.3
Die Gerstensorte. **(The variety — in barley).**
Dtsch. landw. Pr. 1940 : **67** : p. 77.

A brief note on the importance of good adaptation to the cultural environment as a factor in the yield and quality obtainable from a particular variety of barley.

995. 633.16–1.557:575.143
Immer, F. R. 633.16:575:578.08
Relation between yielding ability and homozygosis in barley crosses.
J. Amer. Soc. Agron. 1941 : **33** : 200–06.

In a small-scale, replicated yield trial with spaced plants the yield and yield factors of the F_1 of six crosses were compared with those of the parents. The F_1 on the average exceeded the mean of its parents by 8·3% in number of ears per plant, 11·1% in number of grains per ear, 4·9% in weight per grain and 27·3% in yield per plant.
In the next year (1939) the yield of the F_2 and F_3 of the same crosses was compared with that of the parents in drilled plots and in the succeeding year (1940) the F_2, F_3 and F_4 were studied

in the same way. The average excesses in yield for F_2, F_3 and F_4 were 24%, 13% and 5% respectively. This decline agrees with that expected on the basis of increase of homozygosis. Analysis of the results showed that yield trials with F_2 or F_3 bulks may be of value to the plant breeder in predicting the average yield of a cross and so enabling him to concentrate on the high-yielding crosses. Tests of the F_1 are difficult and are also less reliable because not all varieties respond in the same way to spaced planting, as was shown by a subsidiary experiment.

996. Middleton, G. K. and
Chapman, W. H. 633.16–2.451.2–1.521.6
Resistance to floral-infecting loose smut (*Ustilago nuda*) in fall-sown barley varieties at Statesville, North Carolina.
Phytopathology 1941 : **31** : 351–53.

Differences in susceptibility of barley varieties to loose smut have been noted. To obtain more specific information on certain varieties, floral inoculations by Moore's partial-vacuum method have been carried out. The data show a decided difference in varietal susceptibility, e.g. 45% of inoculated heads produced smutted plants in N.C. Bearded 70 while the figures were 36·5 for Tennessee Hooded, 6·7 for N.C. Beardless 26 and 0 for N.C. Bearded 15. Within individual varieties, however, there was much variation in results and there is a need for an improved inoculation technique.

997. Stanford, E. H. and
Briggs, F. N. 633.16–2.421.1–1.521.6:575.11
Two additional factors for resistance to mildew in barley.
J. Agric. Res. 1940 : **61** : 231–36.

The variety Psakhon (C.I.6305) carries a single dominant factor Ml_p for resistance to race 3 of *Erysiphe graminis hordei*. This factor is identical with one of the factors previously reported in Arlington Awnless, Nigrate and Chinerme and tentatively called Ml_x.
The variety Duplex (C.I.2433) was found to carry Ml_h, the Hanna factor for resistance to race 3, Ml_p and ml_d, a recessive factor for resistance which may possibly be linked with Ml_4 or Ml_g. There are now seven factors known for resistance to race 3 (cf. "Plant Breeding Abstracts", Vol. IX, Abst. 574, Vol. VIII, Abst. 858, and Vol. VI, Abst. 557).

MILLETS AND SORGHUM 633.17

998. 633.171–1.524(43)
Berkner. 633.174–1.524(43)
Die Hirsearten und ihre Kultur. (**The millet and sorghum species and their cultivation**).
Dtsch. landw. Pr. 1940 : **67** : p. 29.

The areas of cultivation in Europe and the cultivated forms of millet are briefly indicated with descriptive notes on the different species and varieties of millets and sorghums. The forms suitable for extending millet cultivation in Germany are mentioned.

999. Karper, R. E. 633.174:575(78.8)
Registration of improved sorghum varieties, II.
J. Amer. Soc. Agron. 1941 : **33** : 257–58.

In 1940 two improved varieties of sorghum were approved for registration by the American Society of Agronomy under the following numbers: Coes—77, Highland—78.
Coes (C.I.1104) is a dual purpose sorghum bred by the U.S. Dry Land Field Station, Agron, Colorado and the Colorado Experiment Station by selection from Modoc sorghum. It is of early maturity, well adapted to higher altitudes and northern latitudes of the sorghum region. Non-shattering but threshing free from the seed, it is susceptible to smut but resistant to "weak-neck" disease.

Highland is another dual purpose sorghum developed by the same two stations by selection from Dawn kafir. It is early, adapted to the highland section of the Central Great Plains, non-shattering but threshing free from the seed, susceptible to smut but resistant to "weak-neck" disease.

1000. Jones, J. W. and
Longley, A. E. 633.18:576.356.5:576.354.4
Sterility and aberrant chromosome numbers in Caloro and other varieties of rice.
J. Agric. Res. 1941 : **62** : 381–99.

Meiosis was studied in haploid, sterile diploid, aneuploid, triploid and tetraploid rice plants. In the haploids the number of bivalents at first metaphase never exceeded two. The sterile diploid plants had a normal chromosome number of $2n = 24$ but many of them showed partial asynapsis. Of the two aneuploid plants studied, three had $2n + 2$ and two $2n - 1$ chromosomes. The relative sizes of pollen grains and stomatic guard cells were determined for haploid, diploid, triploid and tetraploid plants of the Caloro variety. Measurements of leaf width, height and panicle length were also made. The polyploid types appear to be of no practical value. The chromosome number of *Oryza latifolia* from Cuba was found to be $2n = 48$ and of the same species from the Straits Settlements $2n = 24$. The tetraploid Cuban type formed 24 bivalents and no quadrivalents at meiosis.

1001. Shiga, N. 633.18:576.356.5:581.162.5
(Triploid plants in upland rice).
Plant Breed. News 1935 : **10** : 1051–52.

In the F_2 of the cross Kokka x Denyu No. 1 four sterile plants were found and three others among the three upland rices, Denyu a. Mino Early and Konosu Upland No. 4. All seven were triploids ($2n = 36$) and had thicker stems, slightly broader leaves, larger grains, longer awns and other features similar to Nakamori's lowland triploids (cf. "Plant Breeding Abstracts", Vol. III, Abst. 434).
The author's triploids differed from Nakamori's in being sterile.

1002. Terao, H.,
Kondo, Y.,
Doi, Y. and
Izumi, S. 633.18:581.162.036.5
[Physiological studies of the rice plant with special reference to the crop failure caused by the occurrence of unseasonable low temperature. (IV) Varietal differences of rice in regard to the anthesis and fertilization under low temperature].
Proc. Crop Sci. Soc. Japan 1940 : **12** : 203–08.

Some of the leading rice varieties in North Eastern Japan, Mantaro, Norin No. 1, Sekiyama No. 2, Kyuhei No. 2, Oni-shogun, Showa No. 2, Rikuu No. 132, Kamenoo No. 1, New Ishijiro and Oou No. 2, were used to determine any varietal differences exhibited out of doors and in cold chambers at 17° C. and 18° C., in regard to anthesis and fertilization.
In the cold chambers the onset of anthesis was delayed and its duration prolonged; and the percentage incidence of anthesis was low. Norin No. 1, Kyunei No. 2 and New Ishijiro showed low percentages for absence of anthesis in contrast to Oou No. 2 in which the corresponding percentage was particularly high. On the whole varieties with low percentages for absence of anthesis showed high early anthesis percentages.
Varieties characterized by early anthesis exhibited high fertilization percentages at low temperatures; and the later the anthesis in a variety the lower was its percentage of fertilization.
Varietal differences in fertilizing capacity were also noted—Mantaro, Norin No. 1, Showa No. 2 and Rikuu No. 132 being high in this respect, and New Ishijiro and Oou No. 2, particularly low.
No general correlation could be established between anthesis and fertilizing capacity of the plants in the cold chambers.

1003. Terao, H.,
Otani, Y. and
Doi, Y. 633.18:581.162.3.036.5
[**Physiological studies of the rice plant with special reference to the crop failure caused by the occurrence of unseasonable low temperature. (V) Anthesis and fertilization as affected by the low temperature treatment on heading**].
Proc. Crop Sci. Soc. Japan 1940 : **12** : 209–15.

Two groups of lowland rice of the varieties Norin No. 1 and Rikuu No. 132 were subjected to a temperature of 15° C. during heading, the treatment in one plot (A) beginning at 6 p.m., and in the other (B) at 8 a.m. Both groups received treatments lasting 1, 2 and 4 days.
Anthesis scarcely occurred at all in the A group. In the B group the incidence of anthesis (however low) increased as the duration of the treatment grew longer, but fertilization was very poor.
The fertilization percentages were lower in plot B than in A, except when bad weather prevailed between sun rise and 8 a.m. when the percentages in both plots were similar.
In general the longer the exposure the lower the percentages of fertilization.
The nearer the glumes were to flowering the more serious were the injuries due to the low temperature.

1004. Terao, H.,
Otani, Y.,
Tyo, Z.,
Doi, Y. and
Huziwara, T. 633.18:581.162.3.036.5
[**Physiological studies of the rice plant with special reference to the crop failure caused by the occurrence of unseasonable low temperature. (VI) Fertilization in the spikelets subjected to the low temperature treatment after flowering**].
Proc. Crop Sci. Soc. Japan 1940 : **12** : 216–27.

Rice spikelets subjected within 30 minutes of opening of the flowering glumes to 15° C. for 20 or 45 hours showed very low percentages of fertilization; but when so treated 30 minutes or more after flowering showed much higher percentages, and exposure 60 minutes or more after flowering produced scarcely any ill effects on fertilization.
Treatment at 15° C. for 45 hours resulted in greatly delayed or inhibited fertilization, but when the temperature was raised, fertilization capacity was gradually restored. Such recovery apparently depends largely on the time between the onset of flowering and the treatment and is probably determined by how long the pollen tubes have grown and how tightly the glumes were closed when the treatment began.
An hour or more after flowering begins, a temperature of 15° C. or (thereabouts) lasting even 2 days has hardly any effect on fertilization even under natural conditions.

1005. Kawamura, E. 633.18–2.484–1.521.6:575
(**Reaction of certain species of the genus *Oryza* to the infection of *Piricularia Oryzae***).
Bult. Sci. Fak. Terk. Kjusû Univ. 1940 : **9** : 157–66.

Inoculation experiments showed that *O. sativa* and *O. cubensis* with 24 somatic chromosomes are susceptible to *P. Oryzae* while *O. latifolia* and *O. minuta* with 48 somatic chromosomes are highly resistant. F_1 plants of the cross *O. sativa* x *O. minuta* were as resistant as *O. minuta*.

1006. Adair, C. R. 633.18–2.484–1.521.6:575.11
Inheritance in rice of reaction to *Helminthosporium oryzae* and *Cercospora oryzae*.
Tech. Bull. U.S. Dep. Agric. 1941 : No. 772 : Pp. 19.

The inheritance of resistance to *Helminthosporium oryzae* B. de H. was studied in the cross Mubo Aikoku (resistant) x Supreme Blue Rose (susceptible). Resistance was recessive and apparently controlled by several factors. The reaction of seedlings grown in the greenhouse was correlated with that of mature plants in the field.
The lateness of Supreme Blue Rose was dominant over the earliness of Mubo Aikoku, giving

a 3:1 ratio and the red colour of the tips of the flowering glumes of Mubo Aikoku was dominant over the green of Supreme Blue Rose, also giving a 3:1 ratio. These two characters were independent of each other and of reaction to *H. oryzae*.

The inheritance of resistance to *Cercospora oryzae* Miy was studied in several crosses. The results were not entirely consistent owing to the difficulty of classifying individual plants, but it is concluded that there is a single allelomorphic series controlling reaction to *C. oryzae*: Supreme Blue Rose carried a factor for susceptibility dominant to the factor for resistance carried by Meshibu and other resistant varieties. The latter factor is in turn dominant to the factor for susceptibility carried by other susceptible varieties, Zenith, Early Prolific and Carolina Gold. The problems of modifying factors and physiological races need to be investigated. The associations of resistance with other characters were slight and not of a type likely to hinder the breeding of valuable resistant strains.

It is maintained that resistance to *C. oryzae* is not due to morphological characters such as the size of intercellular air spaces.

FORAGE GRASSES 633.2

1007. Brittingham, W. H. 633.21:575.127.2:576.356.5

An artificial hybrid between two species of bluegrass, Canada Bluegrass (*Poa compressa* L.) and Kentucky Bluegrass (*P. pratensis* L.).

J. Hered. 1941 : **32** : 57–63.

An abstract of the work described in this paper has already appeared (see "Plant Breeding Abstracts", Vol. XI, Abst. 394). The present paper also includes details of the emasculation technique used and several photographs of the parents and the hybrid.

1008. Tinney, F. W. and Aamodt, O. S. 633.21:581.163

The progeny test as a measure of the types of seed-development in *Poa pratensis* L.

J. Hered. 1940 : **31** : 457–64.

Less than two per cent. of variants were observed in single plant progenies of *P. pratensis* and this uniformity is taken as confirming the predominantly apomictic reproduction of this plant. Breeding work is therefore greatly simplified.

1009. Myers, W. M. and Chilton, S. J. P. 633.22–2.111–1.521.6:575.11 633.24–2.111–1.521.6:575.11

Correlated studies of winterhardiness and rust reaction of parents and inbred progenies of orchard grass and timothy.

J. Amer. Soc. Agron. 1941 : **33** : 215–20.

Spaced plantings of timothy and orchard grass (*Dactylis*, cocksfoot) consisting of clones with their first inbred progenies adjacent to them and replicated three times at random were subjected in 1939 to rust attacks (*Puccinia graminis* on cocksfoot and *P. phlei-pratensis* on timothy), followed by severe winter conditions in the winter 1939-40. The individual plants were classified for rust injury and winter injury.

In both cocksfoot and timothy an analysis of variance showed that highly significant differences occurred between clones in respect of winter injury and the reaction of the inbred progenies was closely correlated with that of the parental clone, $r = 0{\cdot}905$ for cocksfoot and $0{\cdot}849$ for timothy. A χ^2 test showed that winter injury was correlated with rust injury in timothy but failed to give evidence of this effect in cocksfoot. The rust attack was more severe on timothy.

Segregation for winter injury was observed in some inbred progenies.

1010. Levan, A. 633.24:581.481:576.356.52:576.356

Syncyte formation in the pollen mother-cells of haploid *Phleum pratense*.

Hereditas, Lund 1941 : **27** : 243–52.

From more than half a million germinating seeds of *P. pratense* there were obtained 384 pairs of twin plants. The majority of these plants had the normal chromosome number of $2n = 42$.

Seven of them, however, were haploids with $2n = 21$. Meiosis was studied in two of these haploids and was found to be very irregular. Some pollen mother cells have 7 bivalents plus 7 univalents, others 21 univalents. The most striking irregularity observed was cell fusion in meiotic prophase. From 2 to 30 pollen mother-cells may fuse to form one large syncytium. At first metaphase these large cells develop only one bipolar spindle on which all the bivalents present are arranged in one regular equatorial plate. Thus one syncytium had at least 150 bivalents plus 150 univalents and in this cell the bivalents were arranged quite regularly on a single metaphase plate.

1011. KARPER, R. E. and QUINBY, J. R. 633.282:575.127.2:633.174

Breeding new varieties of Sudan grass.

Progr. Rep. Tex. Agric. Exp. Sta. 1940 : No. 707 : Pp. 3. (Mimeographed).

New synthetic varieties of Sudan grass having valuable economic characteristics not present in the old common variety have been obtained by crossing Sudan grass with a variety of sweet sorghum known as Leoti followed by repeated back-crosses to Sudan grass. The valuable characters transferred to these new synthetic varieties from the Leoti parent include sweet stalk, juicy stalk, non shattering seed habit, a distinctive glume colour and resistance to Red Spot (bacterial foliage diseases). The new glume colour, sienna, is very useful in that contamination of the seed with Johnson grass can be easily spotted. Non-shattering is a recessive character. The palatability of the new strains is being tested —some of the new strains appear to be more attractive to animals than the common variety of Sudan grass.

LEGUMINOUS FORAGE PLANTS 633.3

1012. SINSKAYA, E. N. 633.31:576.12:575

Phylogenetic taxonomy as a basis for genetic and breeding work. Illustrated by *Medicago*. (Preliminary communication).

Z. indukt. Abstamm.-u. VererbLehre 1940 : **78** : 399–417.

An extensive programme of work has been planned and is being undertaken by the author and her associates on wild and cultivated alfalfa, including geography, ecology, phylogeny, genetics and breeding methods. An outline is given of the suggested evolution of *Medicago sativa* and other closely related species. *M. hemicyla* is taken as the progenitor of the group which includes both diploid ($2n = 16$) and tetraploid ($2n = 32$) forms from Asia and Europe.

A comparison is made of wild alfalfas with extreme cultivated types, which shows very considerable differences.

A review of the composition of alfalfa populations and the method of type group selection suggests that the best plants for breeding should be selected not according to separate economic characters but according to the sum total of their characters. R. M. I.

1013. 633.32:581.45:575

Hobbyist raises four-leaf clovers.

Sci. Observ. 1941 : **3** : No. 2 : p. 3.

Mr Charles T. Daniels, a telephone engineer of the Panama Canal Zone, has developed a pure strain of four-leaf clover. The pressed leaves are sold in millions for use in various novelties. It is not stated to what species the strain belongs.

1014. RINKE, E. H. and JOHNSON, I. J. 633.321:575.11:581.162.5 633.321:575

Self-fertility in red clover in Minnesota.

J. Amer. Soc. Agron. 1941 : **33** : 512–21.

A self-fertile line of red clover appeared in the fifth generation of a self-pollinated line and has continued to be rather highly self-fertile in 10 subsequent generations of self-pollination. This inbred line is much less vigorous than commercial red clover plants. The F_1 amd F_2 generations of a cross between this self-fertile line and self-sterile commercial red clover were studied. Self-fertility appeared to be dominant in the F_1 generation and nearly all the F_2 plants also appeared to carry the factor for self-fertility. Leaf-marking was a simple dominant to non-marking. Earliness in flowering was dominant in the F_1 and is probably determined by several factors. A method is suggested for the production of inbred plants carrying different

self-sterility genes and the gene for self-fertility and there is also given a plan for the elimination of the fertility gene after using it as a means of selection in self-pollinated lines. It is suggested that breeding by the above method would be quicker than breeding by mass selection.

1015. Atwood, S. S. 633.322:575:581.162.3:578.08
Controlled self- and cross-pollination of *Trifolium repens*.
J. Amer. Soc. Agron. 1941 : **33** : 538–45.

Several pollination techniques which are relatively simple to execute and which yield reasonably precise results are described. These include suction emasculation, pollination with a toothpick, pollinations by bees in cages and rubbing of entire heads. Methods are also described for growing white clover in the greenhouse to obtain an abundance of flowers for controlled pollinations.

1016. Hackbarth, J. 633.367:575"793"(43)
Ein neuer Zuchtstamm von gelben Süsslupinen mit schneller Jugendentwicklung. (**A new strain of yellow sweet lupins with a rapid early growth stage**).
Züchter 1941 : **13** : 65–68.

The great advantages of sweet lupins that grow rapidly in the early stage of their development are indicated with reference to cultivation and crop production and the process of selection by which a yellow sweet lupin (Strain No. 7844) with this character was obtained is described. The new form (Strain No. 7844) had in 60 days reached a height three times that of the controls and at a stage when over half of the latter were no taller than 3 cm., 21% of No. 7844 were 11 cm. and some more over 20 cm. in height.
The suitability of the new form for East Germany is mentioned.
German research is now directed towards combining the new growth habit with other desirable features such as freedom from shedding, which has fortunately been found in sweet lupins.

1017. Hackbarth, J. and Troll, H.–J. 633.367:575.11:581.6
Über die Zahl der Gene für Alkaloidfreiheit bei *Lupinus luteus*. (**On the number of genes for freedom from alkaloids in *L. luteus***).
Züchter 1941 : **13** : 63–65.

Experiments are described which show that v. Sengbusch's "new" strains of *L. luteus* with low alkaloid content carried two genes for absence of alkaloids and that these two factors were identical with the genes *am* and *dul* already known (cf. "Plant Breeding Abstracts", Vol. X, 717).
From their analysis of the evidence the authors conclude that the new strains in question, which were discovered during a survey of local varieties of lupins in various districts in Germany, in fact represent the old sweet lupin varieties already known. The bitter local varieties may have been contaminated by mechanical means or by cross-pollination.
That new genes for freedom from alkaloids may exist and be discovered is of course possible.

1018. Middelburg, H. A. 633.372:575.42:578.08(92.2)
Enkele beschouwingen en mededeelingen over selectie bij *Crotalaria juncea*. (**Some views and information about selection in *C. juncea***).
Bergcultures 1941 : **15** : 208–11.

The researches of Singh, Jagoos and Howard on *C. juncea* for green manure are reviewed with reference to pollination, seed production and selection, and the technical difficulties to be encountered and overcome in such work.
At the Experiment Station for Vorstenlanden Tobacco 'Proefstation voor Vorstenlandsche Tabak' in Java, selection resulted in 1934 in five progenies (Nos. 6, 9, 15, 18 and 21) worth further investigation in trials on a larger scale on estates. Seed was raised at the Station under conditions allowing of cross-pollination between the various types as in the earlier stages of selection.
In trial cuttings in 1935 No. 21 gave the best yield and comprised the most suitable types for use as manure: consequently this strain alone is now to undergo further selection, so that its desirable features may be retained without impurities due to cross pollination. Strain No. 9 gave the best yield in some trials on estates, but showed an extremely branched habit and No. 21 was therefore preferred.

These results show that yield can be increased by selection even without strict isolation of the various plant types and appear to modify to some extent Howard's views on the practical possibility of improving *C. juncea* for green manure by selection.
The station at Klaten has some selected seed annually available for members.

1019. Schröck, O. 633.375:581.6:575(43)
Die Züchtung alkaloidarmen Geissklees, *Galega officinalis*. (**The breeding of goat's rue, *G. officinalis*, with low alkaloid content**).
Züchter 1941 : **23** : 115–17.

Galega species are of value as fodder plants and *G. officinalis* is now being studied in Germany as a crop that thrives in relatively poor soil. Among some thousands of experimental plants one withstood the winter of 1939/40 and from this plant it is hoped that a winter-hardy strain may be obtained.
The toxic principle of the plant is galegine (a derivative of guanidine) and since 1937 selection against this feature has been in progress with plants obtained from a sample of seed from Chile.
Sengbusch's method of chemical analysis was used in selecting for plants with low galegine content. Among 10,000 plants examined one with a low galegine content and no abnormalities of growth or fertility was discovered. Low galegine content has proved recessive to a high content. Incidentally in one of the experimental crosses (61 x 20) a white flowered form occurred and has been identified with f. *albiflora* Boiss.(=var. *lemantha* Schur., =f. *alba* Alef.), one of the three known mutants of the species *G. officinalis*. This mutation and another character, chlorophyll deficiency, were apparently monofactorial recessives.

ROOTS AND TUBERS 633.4

1020. Foulon, L. A. 633.491(82)
El problema economico de la papa. (**The economic problem of the potato**).
Inst. Econ. Legislac. Rur., Fac. Agron. Vet., Univ. B. Aires 1939 : **2** : Pp. 361.

The monograph includes very brief accounts of the mode of reproduction of the plant, of the chief methods of improvement, of the main varieties grown in Argentina, of the chief diseases and pests and of the origin and evolution of the domestic potato.
The remainder of the work is concerned with production.

1021. Lamm, R. 633.491:575.127.2:576.356:575.182
Varying cytological behaviour in reciprocal *Solanum* crosses.
Hereditas, Lund 1941 : **27** : 202–08.

An abstract of this paper occurs in the Proceedings of the 7th International Genetics Congress, (see "Plant Breeding Abstracts", Vol. XI, Abst. 554).

1022. *Ivanovskaya, E. V. 633.491:575.127.2:576.356.5
(**Cytological analysis of hybrids between diploid and tetraploid species of potatoes**).
Bull. Acad. Sci. U.R.S.S., Sér. Biol. 1941 : No. 1 : 21–33.

Studies were made of hybrids of *Solanum tuberosum* ($2n=48$) and the diploid species *S. Rybinii*, of interest for its partial virus resistance, and *S. phureja*, whose tubers contain up to 19·56% of protein. *S. Rybinii* is also without dormancy, which is of interest in breeding early forms, and has large numbers of tubers, which may be a factor in breeding for yield. Chromosome numbers are given for 30 F_1 plants from 19 different combinations, and for two F_2 plants and one triple hybrid (Epicure x *S. Rybinii*) x Fürstenkrone. Only 7 of the F_1 plants had the expected 36 somatic chromosomes, 22 had $2n=48$ and one $2n=24$. Both F_2 plants *S. phureja* x Centifolia and also the triple hybrid had $2n=48$. These figures were in certain cases only approximate, the actual chromosome number being in some hybrids 37, and in some 49 or even 50, owing evidently to slight discrepancies in the domestic gametes.
The 36-chromosome hybrids were sterile, but many of the 48 chromosome plants formed berries by open pollination.

---

* An extended summary of this paper is on file at the Bureau.

A larger proportion of the 48-chromosome hybrids appeared in the crosses where the diploid species was the maternal parent than in the reverse cross.
The hybrids morphologically show greater resemblance to *S. tuberosum*, though certain characters of the other species are evident. Detailed descriptions of some of the hybrids are given. It is clear that the hybrids are neither matroclinous nor patroclinous, and they would appear to owe their origin to the union of an unreduced gamete of the diploid parent with a normal gamete of the domestic parent. The presence of two sets of chromosomes of the diploid species, combined with their fertility, lends them a special interest from the breeding point of view.
Observations were made on meiosis in the two diploid species, where certain irregularities were detected, including the formation of dyads, monads and certain giant cells, leading to the supposition that these species form diploid gametes, though in very small numbers, and that the tetraploid hybrids have arisen from them. When *S. phureja* and *S. Rybinii* were crossed with certain other diploid species they gave only diploid progeny. There seems to be some sort of selective fertilization therefore in the crosses with the tetraploid species and this would also account for the low seed content of the fruits from such crosses.
Meiosis in the triploid hybrids was accompanied by irregularities of various degrees, which are described. The 48-chromosome hybrids were more regular.
Seeds produced by natural pollination of the hybrid *S. Rybinii* x Hindenburg were sown in 1939. Only 6 plants out of 55 remained healthy; many were dwarf (fig. 10), 16 plants not having surpassed 15 cm. in height. Segregation occurred in respect of flower characters and certain characters of the leaf, indicating that pairing has taken place between the chromosomes of the two species. The frequency of dwarf plants in the progeny suggests that the two genoms are somewhat distantly related.
Certain other crosses between diploid and tetraploid species were examined for comparison.

1023. Edmundson, W. C. 633.491:581.143.26.035.1:581.162.5
Response of several varieties of potatoes to different photoperiods.
Amer. Potato J. 1941 : **18** : 100–12.

A number of potato varieties were grown under 9-, 11 , 13 , and 17-hour photoperiods in the greenhouse. Among other results it was found that the plants in the 17-hour photoperiod produced the most buds for pollination and developed the most seed balls and the largest weight of seed.

1024. Nash, L. B. 633.491:581.6:581.192
Relation of variety and environmental condition to partial composition and cooking quality.
Amer. Potato J. 1941 : **18** : 91–99.

The specific gravity, percentage dry weight, percentage starch, total nitrogen, protein nitrogen and tyrosine contents and cooking quality were determined for a number of potato varieties, each variety being grown in four localities. Green Mountain and Pioneer Rural were found to be more mealy than the other varieties and Pontiac, Chippewa and Earlaine were usually the least mealy. The results of chemical analysis do not help to explain why certain varieties blacken and others do not.

1025. Köhler, E. 633.491–2.8–1.521.6
Untersuchungen über Y-Virus-Resistenz bei Kartoffeln. (**Investigations on Y-virus resistance in potatoes**).
Züchter 1940 : **12** : 273–75.

The resistance to Y-virus was tested in the following varieties: Altgold, Ackersegen, Parnassia, Konsuragis, Jubel and a very resistant strain BRA 9089, bred by K. O. Müller. As a result of the experiments, the varieties in order of resistance were: Altgold, Jubel, Konsuragis, 9089, Parnassia and Ackersegen. The results for strain 9089 are not strictly comparable with the others as it is not certain whether the infection was new or the result of an older infection. The increased infection of the tubers, especially of the more susceptible varieties, in a later planted series suggests a relationship between resistance to the Y-virus and attack of leaf-roll. R. M. I.

1026. MILLER, J. C. 633.492:575:581.6(76.3)
Breeding sweet potatoes for table stock and for starch.
Proc. 42nd Annu. Conv. Ass. Sth. Agric. Wkrs, Atlanta, Ga., February 5–7, 1941 : 158–59.

A short account is given of the sweet potato breeding at the Louisiana Agricultural Experiment Station. New seedlings which have higher sugar content and twice the carotin content of any of the present table varieties have been developed. Of the seedlings being bred for high starch content, L4–5 is especially high in starch and is also a high yielder.

FIBRES 633.5*

1027. GAVRILOV, G. 633.51:575(47)
(Cotton breeding in the Kara-Kalpak A.S.S.R.)
Sovetskii Khlopok (Soviet Cotton) 1940 : No. 3 : 39–40.

Early varieties were crossed with varieties possessed of other desirable qualities. In the F_1 only those plants equal or superior in earliness to the early parent were selected. In this way the variety Č–925 was produced, which in 1938 yielded 32 c. per ha. as compared with 20 c. from the standard variety 1306. This new variety and Č–2186 from the same cross, have also excelled the existing varieties in spinning tests, the results of which are recorded.

1028. KULEBJAEV, V. 633.51:575(47)
(New varieties of Soviet long linted cotton in Turkmenistan).
Sovetskii Khlopok (Soviet Cotton) 1940 : No. 11–12 : 34–44.

From 1931–1939 the Turkmenistan Cotton and Lucerne Experiment Station has produced the following promising, relatively high yielding and high quality varieties of cotton of the Egyptian type with long lint: Nos. 2963 I, 348 II, 3169 I, 283 I2, 1076 I, 151–2 I, and 910 I. Particulars are given of their origin and their characteristics and performance in various trials and in spinning tests.

In 1933 in order to obtain a cotton plant of compact habit for mechanized harvesting, some hybridization experiments were begun by the author with two selections from Ashmouni—0670, namely 283 I2 (used as the female parent) and 1076 I (as the pollinator) and these selections were characterized by earliness and short sympodia and internodes. Nine combinations were made. In the third generation family No. 101 from one combination segregated for 4 types of branching; and strain No. 3169 I was selected for multiplication as a line with the determinate branching habit, though some segregation was found to be still occurring in the F_4.

Strain 151–2I is another early variety in which plants without monopodia frequently occur.

Economic conditions in the U.S.S.R. have created a demand for cottons with coarser lints, but of good quality, for admixture with wool in manufacture or for use as a substitute. In these types high yield, large bolls and disease resistance must also be combined. Some large bolled types with coarse lint have been bred from lines of *Gossypium barbadense* crossed by *G. peruvianum*, the final selections from this cross being lines Nos. 4844 I and 4848 I. Another line No. 4842 I derived from hybridization of the same two species has a more compact habit than the two foregoing lines.

These interspecific crosses are said to be also producing some quite new forms which may possibly be of economic value.

1029. TSINDA, K. 633.51:575(47)
(The Egyptian cotton variety 213).
Sovetskii Khlopok (Soviet Cotton) 1940 : No. 3 : 35–37.

The variety was produced in 1931 by individual plant selection from the variety Janovič. It is 7–8 days earlier than Maraad and yields 44% more cotton before the onset of the frosts than Pima and Maraad; this is a great advantage since such cotton is of a higher quality than that produced later. Its average yield of seed cotton in the six years 1934–39 was 16·4% higher than that of Maraad. Its yields have been much higher than Maraad in tests on collective farms, the difference in seed cotton varying from 0·5 to 14 c. per ha. and in lint from 0·3 to 5·6 c. per ha. In two cases its yields have been the same as Maraad but it was never inferior.

The variety is distinguished by bolls above the average in size, equal to or somewhat larger

*See also Abst. 899.

than Maraad, many having 4 locks and occasionally 5. The ginning percentage was 29–31 as against 29–30% in Maraad. The 1,000 seed weight was 130–140 grm., the seeds being almost naked. The plant is some 10–30 cm. less than Maraad in height and is less spreading in habit. The stems are strong and pigmented. Monopodial branches are few or absent; there are many subsidiary sympodia and 2 bolls are frequently borne in one axil and the yield is therefore reliable.

The lint length varies from 37 to 40 mm., with an average of 37–39; the lint is thin (metric number 7,200–7,900) and strong, with a very high breaking length. In quality of both lint and fabric the new variety is regarded as superior to Maraad.

1030. Inozemtsev, A. 633.51:575:581.6(47)

(Long stapled varieties of Egyptian cotton in the Azerbaijan S.S.R.).

Sovetskii Khlopok (Soviet Cotton) 1939 : No. 9 : 28–33.

New varieties of Egyptian cotton distinguished by greater earliness, productivity and length of lint have been produced. The best are D–96 and 3408–1, which are 22–23 days earlier than the variety hitherto grown and have a lint length of 46–48 mm. They exceed the previous variety by 45–52% in yield of seed cotton and by 18–27% in lint yield; 89–91% of their yield is collected before the frosts.

1031. Gattenberger, P. 633.51·575"793":581.6

(Replace the cotton variety 1306 by better varieties).

Sovetskii Khlopok (Soviet Cotton) 1939 : No. 11/12 : 29–32.

The variety 1306 is the earliest cotton grown and has enabled cotton cultivation to be extended northwards as far as latitude 50° N. Its lint, however, is exceedingly short, in poor years not exceeding 25 mm. In 1937 and 1938 certain new varieties have been released which are about equal to 1306 in earliness but distinctly superior in lint quality, size of boll and many other features, including yield.

The history of the variety 1306 and a number of variants of it is outlined, and there follow descriptions of the new improved varieties referred to. Variety 13751, a selection from a local mixture, is 2–3 days earlier than 1306, its bolls are of medium size, the seed cotton per boll weighing 4 grm.; its ginning out-turn is 32·0 %, which is 1% higher than in 1306; the lint is 27–28 mm., i.e. 1 mm. longer than that of 1306; the cotton does not shed from the ripe bolls. The quality of the lint of this variety from unirrigated land was classed higher than any other. The variety is somewhat more prone to gummosis than the other varieties.

The variety 803, a selection from Karajaz-King, is very high in yield, bears large bolls giving 5–5·5 grm. seed cotton, has a ginning out-turn of 34–35% and lint length of 28/29 mm.; the lint does not shed. This variety is 1–2 days later than 1306 in maturity but is free from gummosis and quite suitable for replacing 1306 in certain areas.

Variety OD–1, a selection from the F_4 of a cross between varieties 915 and 1306, has exceeded 1306 in yield, equals it in earliness and has large bolls yielding 4·5–5·0 grm. of seed cotton; it is free from shedding, the ginning out-turn is 34–35% and lint length 27/28 mm.; it is less susceptible to gummosis than 1306.

Variety 14958–4 is 3–4 days earlier than 1306, which it exceeds also in ginning out-turn (34–35%); it is less prone to shedding and the bolls are somewhat bigger. This variety is recommended for the most northerly districts of all; its lint, however, is 1·5–2·0 mm. shorter than that of 1306.

Variety Č–925, a product of individual plant selection from a mixture of Kirda, equals 1306 in earliness, produces 5 grm. seed cotton per boll, with a ginning out-turn of 34–35%, and lint length 29/30 mm.; it outyields 1306 by 6–35%. The lint is pronounced to be of good spinning quality, being 2 mm. longer than 1306 and somewhat stronger.

1032. Ware, J. O. 633.51:575.11:581.6

Seed cover and plant color and their inter-relations with lint and seed in upland cotton.

J. Amer. Soc. Agron. 1941 : **33** : 420–36.

F_2 segregations were studied in two crosses between two plants from different lines of a red variety of upland cotton (Winesap) and two plants from the same line of the No Lint variety. The two Winesap parent plants differed in degree of seed cover—one had seeds completely covered with fuzz while the other plant had a seed cover approximating to Thadani's felted.

Plant colour and seed cover (degree of fuzziness) were found to be inherited independently. Naked seeds and sparse lint are either controlled by two completely linked genes or by the same gene. The F_2 segregated into three general seed cover classes—fuzzy, naked-adherent and naked. The highest lint levels were found in the fuzzy plants of the F_2 generation and very low lint levels in naked plants. The changes in lint level with different degrees of seed cover were also investigated. Plant colour was found to be independent of lint level and seed index also did not appear to be associated with seed cover. High seed index might possibly be associated with green plant colour.

1033. Kulebjaev, V. 633.51:575.127.2:581.6
(New coarse linted forms of cotton).
Sovetskii Khlopok (Soviet Cotton) 1939 : No. 6 : 46–48.

With the object of producing large bolled cottons yielding coarse lint but capable of being used as a wool substitute, crosses were made between Egyptian cottons (*Gossypium barbadense*) and perennial Peruvian cottons (*G. peruvianum*), which were induced to flower by treatment with a 10 hour day.

The F_1 plants behaved as perennials, giving seed only when grown under curtailed illumination. The F_2 generation segregated into annuals and perennials and showed great variations in fertility, lint length and other characters. Segregation was also observed in the F_3 generation. Several plants of the annual, Egyptian type of habit, with coarse, woolly lint were selected; they were all later than Pima in maturity. These plants are described, the first has white, woolly, strong lint 34–36 mm., base 45·4°$_0$, uniformity 1498, strength 6·7 grm. and metric number 4343; the second has creamy, woolly, strong lint, 35–37 m.m., base 41·7°$_0$, strength 6·6 grm., metric number 5350. Some of the hybrids have bolls weighing 5–7 grm. and their lint is considered quite suitable for mixing with wool.

1034. Boza Barducci, T. and 633.51:576.16
Madoo, R. M. 633.51:575.127.2:576.356
Investigaciones acerca del parentesco de la especie Peruana de algodonero *Gossypium Raimondii*, Ulbrich. **(Investigations on the relationship of the Peruvian cotton species *G. Raimondii*, Ulbrich).**
Bol. Minist. Fom., Lima 1941 : No. 22 : Pp. 29.

The history and distribution of the species are described, the author bringing his own observations to bear on the present distribution of this species in Peru. Botanical descriptions of the species, with illustrations, are given; the seeds contain 18·14–18·8°$_0$ of oil and also contain gossypol, which is toxic to animals. Observations on the living plant have shown it to be highly resistant to drought and to a number of insects including thrips, *Empoasca*, *Tarsonymus peruviensis*, *Eriophyes gossypii* and *Anomis texana*.

Crosses were made with a number of other species. With *G. armourianum* as pollen parent 58 flowers pollinated gave 15 bolls, with 161 seeds, of which 23 were empty, 103 contained embryos of varying sizes and 35 were normal. None germinated and the reciprocal cross failed altogether.

With *G. Thurberi* as maternal parent 25 bolls were obtained from 33 flowers pollinated, 19 contained seeds, 304 in all, from which 42 plants were obtained, 25 being hybrids. The hybrids were intermediate, vigorous, flowered freely and were fertile, with 96·5°$_0$ of normal pollen. The reciprocal cross was not successful.

Pollination with *G. Harknessii* gave 1 boll from 9 flowers pollinated, the 7 seeds in it being quite empty.

Crosses with *G. barbadense* as maternal parent were made using the varieties Sea Island, Giza 7, Giza 23 and two forms of Tanguis; 77 flowers pollinated produced 12 bolls from which 15 plants were obtained, none of them having yet flowered. The reciprocal cross failed.

With *G. hirsutum* (variety U4) as female parent, 2 flowers pollinated gave 1 boll, from which 6 plants were obtained. These plants were intermediate, vigorous and flowered profusely but contained only 3·67°$_0$ of normal pollen. The hybrid formed 8 bolls containing 9 seeds, 2 empty, giving 4 seedlings of which only 1 continued to develop.

G. purpurascens as female parent gave 5 bolls from 13 flowers pollinated; 8 plants were obtained but have not yet flowered. The reciprocal cross failed.

Cytological observations made on the species and its hybrids showed the somatic chromosome

number for *G. Raimondii* to be $2n=26$; at meiosis 13 bivalents were observed, though occasionally there were slight irregularities in tetrad formation.
The hybrid *G. Thurberi* x *G. Raimondii* also had $2n=26$ and 13_{II} at meiosis in most of the cells examined, though 2 univalents lying in the position characteristic of secondary association were occasionally observed.
In *G. barbadense* x *G. Raimondii* $2n=39$, as also in *G. hirsutum* x *G. Raimondii*; in the latter hybrid uni-, bi-, tri- and quadrivalents were observed at meiosis, as follows: $12{\cdot}57_{I}+11{\cdot}65_{II}+0{\cdot}87_{III}+0{\cdot}125_{IV}$. Tetrads, pentads, hexads and septads were formed.
In *G. purpurascens* x *G. Raimondii* also $2n=37$.
The behaviour of *G. Raimondii* is compared with that of the other wild species *G. Davidsonii, G. Klotzschianum, G. armourianum, G. aridum, G. Thurberi, G. Harknessii, G. Sturtii, G. anomalum* and *G. Stocksii*, from which it is concluded that it most closely resembles *G. aridum, G. Thurberi, G. armourianum* and *G. Sturtii*. A comparison of the cytological behaviour shows it to resemble most closely *G. aridum, G. Thurberi, G. Harknessii, G. armourianum* and *G. Davidsonii* and to have little or no resemblance to *G. anomalum, G. Sturtii* and *G. Stocksii*. In the hybrids with the $n=26$ species the number of trivalents (0·87) is higher than that observed in other hybrids, most closely approaching the 0·6 for *G. purpurascens* x *G. aridum* and *G. Darwinii* x *G. armourianum*. The number of quadrivalents (0·125) is intermediate between *G. contextum* x *G. armourianum* and *G. purpurascens* x *G. aridum*.
The chromosomes of *G. Raimondii* conjugate with those of *G. Thurberi*.
Morphologically *G. Raimondii* resembles *G. Davidsonii* and *G. Klotzschianum* though certain differences are enumerated; in its semi-angular stems, especially the young stems, the species resembles *G. Thurberi* and in the disposition of the anther filaments *G. armourianum*. In distribution it stands closest to *G. Klotzschianum* of the Galápagos but assuming a possible land connexion would probably come close also to *G. aridum* and *G. Thurberi*.
The conjugation of the 13 chromosomes of *G. Raimondii* with 13 of *G. hirsutum* and with those of *G. Thurberi* shows the species to be cytologically related to the *G. Thurberi, Harknessii, armourianum, aridum* group. It is interesting to note that the hybrid *G. Thurberi* x *G. Raimondii* forms fruits when back-crossed with *G. Raimondii* but not with *G. Thurberi*.
Though *G. Raimondii* crosses with *G. Sturtii* the relationship is regarded as rather distant. It is distantly related also to *G. anomalum, G. Stocksii, G. arboreum* and *G. herbaceum*.
It is thus concluded that *G. Raimondii* belongs to the group of $n=13$ wild New World cottons, in the sub-group *G. armourianum, Thurberi, aridum, Harknessii*; the species *G. Davidsonii* and *G. Klotzschianum*, with which it does not cross, form a separate sub-group.
The hybrid *G. hirsutum* x *G. Raimondii* has not suffered any diminution in lint length in comparison with the cultivated parents and such crosses are thought to be of practical interest for combining the valuable resistances and other characters of *G. Raimondii* with the characters of the cultivated species. By the cross *G. Thurberi* x *G. Raimondii* it is thought possible to combine the resistance to *Heliothis virescens* and *Mescinea peruella* characteristic of the former species with the valuable characters of *G. Raimondii*, for transmission to cultivated species by further crossing.

1035. Moore, J. H. 633.51:581.6
The distribution and relation of fiber population, length, breaking load, weight, diameter, and percentage of thin-walled fibres on the cottonseed in five varieties of American upland cotton.
J. Agric. Res. 1941 : **62** : 255–302.

The distribution and relation of fibre population, length, breaking load, weight, diameter and percentage of thin-walled fibres on the cotton seed were measured for five varieties of American upland cotton (*Gossypium hirsutum*). The results are given and analysed in a series of 42 tables. Six regions were studied in each seed.

1036. Veli-Zade, I. 633.51–2.484–1.521.6(47)
(New wilt resistant lines of Upland).
Sovetskii Khlopok (Soviet Cotton) 1940 : No. 4 : 39–40.

Selections combining resistance to *Verticillium* wilt with high lint length and ginning percentage have been obtained. Line 01363 also has lint of exceptional strength and has beaten the best Upland varieties in yield of lint. Line 01367 was selected from variety 114, from which it differs in lint length (32·2 mm. against 29·4 mm.), larger bolls and 28% better survival

on wilt infected soil. Even those plants that contract the malady do so only at the end of the growing season and not at the period of major attack.

1037. Gorčakov, A. 633.51.00.15(47)
(The cotton research institutes in the third Five Year Plan).
Sovetskii Khlopok (Soviet Cotton) 1939 : No. 11/12 : 17–20.
Certain criticisms of the work of the experiment stations in the past are offered with indications of many possible lines of improvement.

1038. 633.52:575.11–181.13:575"793"
Bartels, K. 633.854.54:575.11–181.13:575"793"
Untersuchungen über die Vererbung quantitativer Eigenschaften : die Stengellänge und Blütezeit des Leins. (**Investigations on the inheritance of quantitative characters : the length of stem and time of flowering of flax**).
Z. indukt. Abstamm.-u. VererbLehre 1940 : **78** : 14–58.
After a discussion of the general position of the problem of the inheritance of quantitative characters, an investigation is described on the inheritance of length of stem and time of flowering in three varieties of *Linum*, Cypern and Weimar, which are linseed varieties of subtropical origin, and Stockholm, a flax variety.
A study of individual lines of the varieties and of the progeny of crosses between Stockholm x Weimar, showed that stem length is a polymeric condition involving at least three factors. A detailed genetical and statistical analysis of the variability of the progeny of crosses of the three varieties was made. The investigation indicated the presence of a main growth-regulating factor *A*. The factors appeared to have an additive action on stem length. It is also suggested that a quantitative character such as stem length is dependent on factors determining the rate of cell division and also factors controlling nutrition.
The genetics of the time of flowering was studied in a strain of the cross Stockholm x Weimar. The results showed that at least three factors are involved and that the main factor for stem length is identical with that for time of flowering. R. M. I.

1039. Heyn, A. N. J. 633.526.18–1.524:581.6(92)
Agel- en buntalvezel. (**Fibre of the gebang palm and of the talipot palm**).
Bergcultures 1941 : **15** : 162–63.
The merits of these two fibres in the Netherlands East Indies as substitutes for raffia are considered with observations on the improvement of their quality and possible ways in which their uses could be extended.

1040. Nilsson, H. 633.584.3:575.127.2:575.11
Eine segregate Form von *Salix caprea*, die durch Stecklinge vermehrt werden kann. (**A segregate type of *S. caprea*, which can be multiplied by means of cuttings**).
Hereditas, Lund 1941 : **27** : 309–12.
A shrub resembling *S. caprea* in all characters, both vegetative and floral, was found in the descendants of the F_2 of the cross *S. viminalis* x *S. caprea*. This shrub was called *capreosegregata* and it also resembles *caprea* in not producing roots on its cuttings (*viminalis* roots easily from cuttings). However in the cross *capreosegregata* x *caprea* there were obtained 15 plants which produced roots readily on cuttings and 9 plants which formed no roots on cuttings. F_1 plants of the cross *S. viminalis* x *caprea* also produce roots on their cuttings. Adventitious root production, therefore, appears to be dominant in this cross and the *capreosegregata* plant to be heterozygous for an inhibiting factor.

SUGAR PLANTS 633.6

1041. Brandes, E. W.,
Taggart, W. G. and
Giles, W. F. 633.61:575(76.3)
Release of new sugar cane variety.
Sug. Bull. N.O. 1941 : **19** : 117–18.
The new variety C.P. 33/243 is to be released for commercial planting on small acreages in

the autumn of 1941. It is an erect cane about as thick as Co. 290, resistant to mosaic and about as susceptible as Co. 281 to root rot. The spread of chlorotic streak can be controlled by rogueing, seed cane selection or hot water treatment. Although artificial inoculation tests have shown it to be very susceptible to red rot, field tests indicate that it is not likely to be extensively injured by the strains of red rot now prevalent in Louisiana. C.P.33/243 is vigorous as plant cane, but tends to be less vigorous as rattoons. Though it only slightly exceeds Co. 281 in sugar per ton of cane it has exceeded that variety by 30% in sugar per acre in plant cane and rattoon tests.

1042. TAGGART, W. G. and
SIMON, E. C. 633.61:575:578.08
The rapid multiplication of a promising new sugar cane variety.
Sug. Bull. N.O. 1941 : **19** : 73–75.

Reprinted from the June 15th, 1933 issue of the Sugar Bulletin, this article describes the rapid multiplication of the variety C.P.28–19 by the single eye method.

1043. BRANDES, E. W. 633.61–2.111–1.521.6:575
A progress report on development of cold tolerance in sugarcane varieties.
Sug. Bull. N.O. 1941 : **19** : 46–47.

The cold resistant canes from Turkestan continue to show high resistance to rather severe freezing temperatures, as low as 15° F. They have been crossed with commercial canes and the first and second back-crosses to the commercial parent or other commercial canes have been made. The stubbles of the F_1 are more resistant to cold and are able to start growth earlier than the present commercial varieties. Among the first back-cross seedlings, which may be expected to have inherited some degree of cold resistance, the essential characteristics of commercial canes are present. Plots for testing cold resistance are being established in Northern Louisiana and other states (cf. also "Plant Breeding Abstracts", Vol. X, Abst. 1071, Abst. 502 and Vol. IX, Abst. 1536).

1044. BOOBERG, G. 633.61.0014:578 08
Aanplantkwesties. (**Planting problems**).
Arch. Suikerind. Nederland Ned.-Ind. 1941 : **2** : 101–09.

In this paper an explanation is included of the value of combined variety—ZA trials in determining manurial requirements and the merits and performance of any new variety of cane.

1045. LYNES, F. F. and
CORMANY, C. E. 633.63:575:578.08
A method of forming a permanent pedigree record for breeding strains of sugar beets.
J. Amer. Soc. Agron. 1941 : **33** : 368–70.

A system of forming a card file which will give a permanent pedigree record of the strains of sugar beet produced by a breeder is described.

1046. SCHWANITZ, F. 633.63:575.247:575.12:633.416
Eine somatische Mutation an der Rübenwurzel. (**A somatic mutation in the beet**).
Züchter 1941 : **13** : 87–88.

In an F_1 plant from a sugar beet (Klein-Wanzleben Z) x fodder beet (Remlinger) cross a somatic mutation was found exhibiting in the lower part of the root a light yellow sector that was prolonged downwards into a root which had twisted round it a much narrower red strip forming several spirals.

This variation may be the result of a mutation of *R* to *r* in the aberrant sector, thus producing tissue with the genetic formula *rrGg*. The occurrence of the yellow in the mutated sector as well as the yellowish colour of the red of the F_1 plants indicates that the yellow is formed in the hybrids from this cross, but is incompletely manifested owing to the simultaneous presence of red coloration. The yellow sector was much paler than is normal in the Remlinger—probably owing to *G* being heterozygous in the mutated tissue.

Evidence was also obtained from this cross and from a Klein-Wanzleben N x Kirsches Ideal cross that other plants too among the experimental material were either *rrgg* or *Rrgg*, the mutation apparently having occurred repeatedly in sugar beet.

1047. VENDRIKH, Ju. V. 633.63:575.42:581.02
(Cultural methods of plant nutrition and mass selection as a means of improving varieties and increasing yields in sugar beet).
Trudy Moskovskoi ordena Lenina Sel'skokhozjaistvennoi Akademii imeni K.A. Timirjazeva 1940 : **5** : No. 2 : 5–31.

Different individuals of a variety react differently to changes in growth conditions; thus some individuals in a population respond very pronouncedly to irrigation, vernalization, manuring, etc., and others respond less or not at all. Very marked improvements can be effected by selecting the most responsive forms.

Observations were made on the Kharkov E type of sugar beet grown under normal and under intensive conditions—artificial rainfall, NPK manuring and vernalization. The percentage of bolting was 4·52% in the normal and 16·9% in the intensive conditions. Similar observations were made on two selections of the Kharkov strain, the one made in the direction of annual habit, the other in the direction of biennial habit. The bolting in the biennial selection was 0·75% under normal conditions and 4·38% under intensive conditions, showing that the response in this direction had been very distinctly reduced by selection, particularly as regards vernalization. The bolting in the annual selection was 45·8% under normal and 58·8% under intensive conditions (without vernalization). In the following year, after further selection for annual habit, the bolting rose to 67·0% under normal and 88·7% under intensive conditions and after a further year's selection the population consisted of 98% of bolters.

The response in yield was also affected by selection. The yield of the initial strain was raised by artificial rainfall from 111–122 to 304–326 c. per ha., the sugar content being reduced by about 0·5%. Manuring raised the root yield by about 10–20 c. per ha. Vernalization raised the root yield in the unwatered set but not in the watered, where the bolting was much increased; hence the seed yield rose from 0·62 to 5·0 c. per ha.

In the first year's annual selection the seed yield was 4·54 c. per ha. under normal and 24·4 c. under intensive conditions; in the second year's selection the seed yields were 9·9 and 42·0 c. per ha. respectively. The root yields in these selections, however, were much reduced: for the first selection 75–90 and 190–230 c. in normal and intensive respectively, and in the second selection 60 and 120–140 c.

The biennial selection was about the same in root yield and sugar content as the initial strain under normal conditions, and the total root yield—i.e. annual roots plus biennial roots—was just as high or higher in the initial strain as in the selection. Under intensive conditions, however, the biennial selection exceeded the initial strain by 29 c. per ha. in weight of biennial roots and by 0·6% in sugar content; the total root yield was also higher but the seed yield was only 0·42 c. per ha., which is less than that of the initial strain.

The response to vernalization, too, was altered by selection. Thus vernalization without watering but with manuring raised the bolting in the initial strain from 3·4 to 13·9%, the seed yield from 0·62 to 1·42 c. per ha. and the yield of biennial roots from 111 to 122 c. per ha.; with watering the bolting was raised from 8·9 to 16·9%, the seed yield from 3·65 to 5 c., but the yield of biennial roots was reduced from 326 to 304 c. per ha. On the other hand in the biennial selection, without watering bolting was raised from 0·9 to 2·1%, seed yield from 0 to 0·14 c., yield of biennial roots from 115 to 121 c. With watering the bolting rose from 1·6 to 4·4%, seed yield 0·11 to 0·42% and root yield 328 to 333 c. per ha. It is clear therefore that selection has changed the response to vernalization from a negative to a positive one where root weight is concerned.

The conclusion is reached that in order to produce forms suitable for intensive cultivation or any other particular set of conditions it is essential to carry out both selection and variety testing under those conditions so as to ensure that the desired responses are selected.

1048. 633.63–1.521.5:578.08
EGGEBRECHT, H. 633.41–1.521.5:578.08
Die Echtheitsbestimmung von Zucker- und Futterrübensaatgut im Keimlingsstadium. (**The determination of authenticity of sugar and fodder beet seed in the seedling stage**).
Forschungsdienst 1941 : **11** : 42–50.

The author's investigation demonstrated that the method of determining the authenticity of sugar and fodder beet in the seedling stage by the colour of the seedling is valid only for certain groups of varieties. Where it is applicable, however, the method is of considerable value and

it is therefore described in detail with useful illustrations showing the differential colouring of seedlings of sugar and fodder beets.

1049. Beregovaja, M. M. 633.63–2.484–1.521.6:578.08
(The question of artificial infection of sugar beet with *Cercospora beticola* Sacc. in connexion with the production of resistant varieties).
Naučnye Zapiski Sakharnoi Promyšlennosti (Sci. Trans. Sug. Ind.) 1939 : No. 1 : 128–37.

Imported varieties reputed to be resistant to *Cercospora* succumbed to artificial infection more than the local variety Uladovka 2nd Five Year Plan Standard. Artificial infection of this variety was more successful when carried out on the lower surface of the leaf, apparently owing to the greater number of stomata on this surface. Detailed observations were made on the behaviour of the stomata at different times of the day and the influence of this on the results of artificial infection with a suspension of spores was studied. The percentage infection was found to be roughly proportional to the degree of opening of the stomata at the period during which the leaves were exposed to infection. The highest infections were thus obtained in the early hours of the morning. A suspension of spores from fresh leaves gave the best results.

STIMULANTS 633.7

1050. Boyarsky, J. 633.71:575(47.7)
(On the cultivation of high-yield and high-quality varieties of yellow makhorkas).
J. Bot. Acad. Sci. Ukraine 1940 : **1** : 267–74.

The two widely grown yellow varieties of makhorka (*Nicotiana rustica*), Yellow 109 and Yellow 106, produce yields 30% lower than those of the high-yield green varieties. New yellow selections such as "Limonka", "Yellow 25" and "Xantha" are now being introduced. The author of this article crossed the high quality yellow makhorka variety Vergun with the high yield green variety Mutant and selected 36 constant forms of yellow hybrids from the F_5 generations. Next year the selected hybrids were tested and the six best yellow makhorkas from the cross were found to have yields of 17–35% higher than that of Yellow 109. In addition the author selected from a hybrid stock of the Vergun 28 type an early ripening strain with a vegetation period of 36 days as compared with the standard period of 45 days. This type is suited for the northern districts of the Ukraine as well as Eastern Siberia where the variety Yellow 109 matures poorly.

1051. Esteva, C. (jun.) 633.71:575(72.95)
El Instituto del Tabaco de Puerto Rico, sus actividades del presente, sus orientaciones para el futuro. **(The Puerto Rico Tobacco Institute, its present activities and plans for the future).**
Rev. Agric., P. Rico 1941 : **33** : 22–26.

Cigarettes of the American type are replacing those made from the local tobacco and efforts are being made to introduce the "Bright" type of tobaccos into cultivation, and also the Turkish type.
Gigantism has frequently been observed in filler varieties, especially Virginia 9, the giant plants having all so far failed to flower. Attempts are to be made to obtain a fertile hybrid between *Nicotiana Tabacum* and *N. rustica* by the use of colchicine.
Hybrids resistant to mosaic and to black shank have been obtained, some of them being at the same time possessed of desirable commercial qualities.

1052. Modilewski, J. 633.71:575.127.2:576.356.5:575.129
(Cytogenetic investigations on the genus *Nicotiana* X. Cytology and embryology of the amphidiploid *Nicotiana* Dubek 44/39 x *N. silvestris*).
J. Bot. Acad. Sci. Ukraine 1940 : **1** : 189–213.

The amphidiploid *N. Tabacum* Dubek 44/39 x *N. silvestris* forms 36 bivalents at meiosis usually but in some cells a few quadivalents were observed. Both first and second anaphases show some lagging chromosomes—these are more frequently observed in pollen than in embryo sac mother cells. The amphidiploid shows high stability and balance in comparison with *N.*

ditagla and *N. disualovii*. It is suggested that this may be because *N. silvestris* is also a parent of the allotetraploid *N. Tabacum*. The phenomena of inhibition in the present amphidiploid may therefore be less pronounced than in other amphidiploids. The author also suggests that the increase in size of cells and nuclei in amphidiploids is not directly conditioned by the increase in the chromosome number but by complex processes in the plasma on the one hand and between the plasma and nucleus on the other. The significance of amphidiploidy in species formation is considered to be less than that of autopolyploidy. It was also found that, when *N. Tabacum* is pollinated by *N. silvestris*, fertilization begins only after 60 hours as compared with 24 hours which is usual in the genus for self-pollinations.

1053. Greenleaf, W. H. 633.71:575.127.2:576.356.5:581.162.5
Sterile and fertile amphidiploids: their possible relation to the origin of *Nicotiana Tabacum*.
Genetics 1941 : **26** : 301–24.

Greenleaf, W. H.
Sterile amphidiploids: their possible relation to the origin of *Nicotiana Tabacum*.
Amer. Nat. 1941 : **75** : 394–99.

Amphidiploids made by the callus method from the F_1 hybrids, *N. silvestris* x *tomentosiformis*, *N. silvestris* x *Setchellii* and *N. glutinosa* x *tomentosa* are female sterile and male fertile. Amphidiploids were also obtained by crossing several autotetraploid races of *N. tomentosa* and autotetraploid *N. silvestris* (these autotetraploids had also been obtained by the callus method). Two of the amphidiploid lines from tetraploid *N. silvestris* x tetraploid *N. tomentosa* contained partially female fertile plants. The plants from the cross tetraploid *N. silvestris* x tetraploid *N. tomentosiformis* were as sterile as the corresponding callus-induced amphidiploid. A microscopic examination of ovaries showed that megasporogenesis in the completely female sterile amphidiploids *N. silvestris-tomentosa*, *N. silvestris-tomentosiformis* and *N. tomentosiformis-silvestris* is regular but that development of the embryo sacs is arrested in either the two- or four-nucleate stage. Cytological examinations of hybrids between *N. Tabacum* and two of the sterile amphidiploids (genom analysis suggests that *N. Tabacum* is an allotetraploid whose parent species are *N. silvestris* and either *N. tomentosa* or *N. tomentosiformis*) and of the F_1 hybrid between Kostoff's fertile *N. silvestris-tomentosiformis* amphidiploid and the author's female sterile amphidiploid from the same cross show that these hybrids are only partially fertile, the disintegration of some of the embryo sacs resembling that found in all embryo sacs of the sterile amphidiploids. It is suggested that the partial sterility of these hybrids is due to some ovules receiving inviable combinations of genes while other ovules receive viable combinations. Most F_2 plants of the cross *N. Tabacum* x sterile tetraploid *N. silvestris tomentosiformis* and of the back-cross of the F_1 with the sterile tetraploid were found to be fertile. Other evidence was also obtained for the presence of sterility genes in the amphidiploids and it is suggested that the action of the sterility genes is complementary. In the discussion it is pointed out that, while the *N. silvestris-tomentosiformis* amphidiploids resemble *N. Tabacum* most closely in vegetative features and in the form of the flower, *N. Tabacum* probably originated as an amphidiploid between *N. silvestris* and a form of *N. tomentosa* similar to one of the several races which today give partially fertile amphidiploids.

1054. Cooper, D. C. and
Brink, R. A. 633.71:581.162.5:581.483:575.127.2
Somatoplastic sterility as a cause of seed failure after interspecific hybridization.
Genetics 1940 : **25** : 593–617.

The development of the seed in the first six days after pollination is described in detail in *Nicotiana rustica* ($n = 24$) selfed and *N. rustica* x *N. glutinosa* ($n = 12$). The crosses *N. rustica* x *Petunia violacea* ($n = 7$) and *N. rustica* x *Lycopersicon esculentum* ($n = 12$) were also studied.

Although in the crosses fertilization was delayed and reduced in frequency, the development of the hybrid embryos was not essentially different from that of normal embryos. The endosperm however developed more slowly and whereas in the selfed seeds the nucellus remained a single layer of cells, in the hybrid seeds it became meristematic and developed to such an extent that it occupied 75% of the volume of the seed and at the chalazal end it cut off the endosperm

from its food supply. The endosperm in the hybrid seeds aborted and the seeds shrivelled. The length of life of the endosperm was greatly dependent on how long it maintained its connexion with the food supply at the chalazal end.
In normal seeds the vascular bundle in the funiculus extended after fertilization so as to connect with the endosperm through the chalazal pocket, but this extension did not occur in hybrid seeds.
Fertilization was found to take place in all the crosses mentioned.
The similarity of the above phenomena with those found after selfing *Medicago sativa* is emphasized (cf. "Plant Breeding Abstracts", Vol. XI, Abst. 397, Vol. X, Abst. 468, Abst. 510).

1055. Petrenko, A. G. 633.71:581.6
(Physiologico-biochemical characteristics of some peculiarities in the process of starvation of different botanical varieties of tobacco).
Sbornik Rabot Po Posleurožainoi Obrabotke Tabaka. Edited by M. F. Maškovtsev. Vsesojuznyi N-I Institut Tabačnoi i Makhoročnoi Promyšlennosti imeni A.I. Mikojana (VITIM) (All-Union Mikojan Research Institute of the Tobacco and Makhorka Industry) Krasnodar 1940 : No. 142 : 3–82.
Distinct varietal differences were observed in physiological properties. The varieties Tyk-Kulak, Dumar, Dubec 44 and American 572 had properties most suitable for flue-curing whilst Trebizond 1272 and Samsun were more suitable for sun-curing.

1056. Wellensiek, S. J. 633.72:575.1(92.2)
Genetical observations with the tea-plant.
Genetica 1940 : **22** : 435–52.
This paper represents a summary of the author's work in Java on the genetics of tea.
Budding by Forkert's modified method has been found the most satisfactory for vegetative reproduction.
Artificial crosses are made as follows: the corolla and stamens are removed from flower buds ready to open. Pollen collected before from newly opened flowers is immediately placed on the stigma. By this means 12·3% of success was obtained.
The following effects of the stock on the scion are noted: when a number of buddings are made on one young plucking bush, it is often observed that all or none of these take; there are striking differences in the rapidity of shooting within a clone and values of coefficients of variability for individual yield within cuttings of one clone may be half as much as in buddings. It was found that the thicker the diameter of the stock, i.e. the faster the stock grows, the faster the scion grows. There were indications of a modifying influence from the potential yield of the stock on that of the scion.
The effects of soil and climate on seedlings were found to produce considerable modifications in the subsequent growth.
A type with white leaf margins which propagated readily from cuttings, was found to lose this characteristic when transplanted to low elevations. A study of the reaction of the genotype to environmental factors with regard to yield, suggested that genetically low yielders are more easily modified by environmental factors than genetically high yielders and the hypothesis is tentatively advanced that this is a general rule for quantitative characters.
A case of contortion of the stems which proved to be an inherited character is described and the following are considered as inherited clonal characteristics:—
in stems: angle of branching, anthocyanin;
in young shoots: rapidity of wood formation, tendency to fasciation;
in leaf buds: degree of hairiness;
in leaves: size, standing up dentations in unfolding stage, straight or undulating margin, long or short apex, convex or concave midrib, bombated or smooth surface, twisted petioles, striking change in colour from yellowish green to dark green when growing old, shiny or dull old leaf, susceptibility to a disease not further defined;
in flowers: earliness;
in general condition: drought resistance;
in quality of made tea: flavour, tip (being correlated with hairiness of the leaf buds).
The leaf characteristics of *bohea* are found to be dominant to those of *assamica*. This supports the author's contention that the *bohea* variety is the older and that the *assamica* has arisen from it by recessive mutations. Dark and light leaf colour are genetical characteristics but

no data are available as to the mode of inheritance. Leaf shape is also a genetical character. Experiments indicate that genetical differences in rapidity of growth occur at an early age and are related to differences in yield. It is also shown that rapid growth at a later age is also a genetical character related to yield.
Genetical yield differences are shown to exist by both vegetative and generative methods.
R. M. I.

1057. Inoue, T. and
Arima, S. 633.72:576.354.4:576.312.35
(Meiosis in *Thea sinensis* L. I. Causasus tea).
Proc. Crop Sci. Soc. Japan 1940 : **12** : 134–40.
From his analysis of the process of meiosis in Caucasian tea the author concludes that the nucleolus contains the chromatin which forms the chromosomes.
The haploid number of chromosomes of Caucasian tea is 15.

1058. 633.72:581.165.1(92)
Emden, J. H. 633.72.0014(92)
Opzet en inrichting van de proeven tot locale toetsing van een aantal geselecteerde theecloonen. **(Outlay of some experiments for the local testing of a number of tea clones).**
Arch. Theecult. Ned.-Ind. 1940 : **14** : 91–115.
This paper describes in detail the programme of trials that has been drawn up to test further the various high yielding tea clones already selected in comparative tests with seedlings.
The trials (of 50–70 clones each) are planned to take place in 18 different districts in the tea producing areas of Java and Sumatra, and on new clearings on land not previously under tea. The methods of laying out the trials and evaluating the performance and results are outlined and existing records of the yields of the clones in comparison with seedlings are given. Susceptibility to attack by various pests and diseases and to drought will be among the criteria used.

1059. Taunay, A. de E. 633.73(81)
Confronto de variedades. **(Comparison of varieties).**
Rev. Inst. Café S. Paulo 1941 : **28** : 10–16.
Observations starting in the year 1875 have shown the variety Bourbon to give earlier and higher yields than the local coffee Creoulo or Comum under favourable conditions of growth and manuring but under unfavourable conditions the roles have been reversed. Maragogipe has proved superior to Botucatú (Amarelo) but inferior to Bourbon. It is the most resistant to the effects of strong sun and has actually given more yield on the sunny slopes than on the shady side. The varieties grown were far from pure and many hybrids were amongst them. The author, though possessing no conclusive evidence on this point, inclines to the view that Maragogipe is a hybrid between Java coffee and some local form.

AROMATIC PLANTS 633.8

1060. 633.832:581.143.7
633.73:581.143.7
Mededeelingen voor en uit de practijk. **(Information from and for the planter).**
Landbouw 1941 : **17** : 56–58, 61–62.
This series of articles which comprises practical hints of proved value on the cultivation of various crops deals here *inter alia* with the raising of coffee seedlings and of clove trees from seed.

1061. Odland, M. L. and
Porter, A. M. 633.842:581.162.32
A study of natural crossing in peppers (*Capsicum Frutescens*).
Proc. Amer. Soc. Hort. Sci. 1941 : **38** : 585–88.
In plots of the variety Harris Early Giant, single plants were replaced by plants of varieties having characters which were recessive in regard to the corresponding character of Harris Early Giant. Two plants of each variety were planted in different parts of the field. The

percentage of natural crossing was examined by growing the progenies of these plants the following year. Analysis of variance showed that there were significant differences between varieties but not between duplicates of the same variety. The following average values were obtained: Oshkosh 9·1%, Golden Dawn 23·0%, Cayenne 11·0%, White Sweet 10·1%, Red Cluster 14·1% and Ornamental 31·8%.

OIL PLANTS 633.85

1062. Regel, C. 633.85(4)
In Mitteleuropa wildwachsende und angebaute Ölpflanzen. (Wild and cultivated oil plants in Central Europe).
Angew. Bot. 1940 : **22** : 400–13.

A list is given of the oil producing plants classified according to botanical families and giving the percentage of oil obtainable. The following new or less well known plants are described in slightly more detail:—*Lallemantia iberica* (Bieb.) Fisch. et Mey., *Euphorbia lathyrus* L., *E. palustris* L., *Guizotia abyssinica* Cass., *Madia sativa* Molina, *Conringia orientalis* Andriz., and *Reseda luteola* L. R. M. I.

1063. Heggeness, O. A. 633.854.54:575(78.4)
Viking flax.
Bi-m. Bull. N. Dak. Agric. Exp. Sta. 1941 : **3** : No. 4 : 7–8.

Viking was bred by the author from the cross B Golden x Burbank's Golden. It gives a high yield of seed, with high oil content, the oil having a high iodine number. It is shorter than Bison by about 6 inches and somewhat less resistant to wilt (*Fusarium lini*), but is resistant to rust. It has medium sized, golden yellow seed, pale pink flowers and yellow anthers.

1064. Vorob'eva, N. F. 633.854.78:581.46:578.08
(A method of estimating the oil content of sunflower seeds during breeding).
Socialistic Grain Farming, Saratov 1941 : No. 1 : 171–75.

The chief advantages of the method described are that the seeds are dried whole and that the powdered seed is placed in the Soxhlet apparatus in small cartons, of which 25–30 can be held by an apparatus of 100 cc. capacity.
A rough idea of the oil content, sufficient for making preliminary selections, can be gained from the colour and consistency of the powdered seed.

RUBBER PLANTS 633.91

1065. Brandes, E. W. 633.912–2.4–1.521.6(73)
Rubber on the rebound—East to West.
Agric. Amer. 1941 : **1** : No. 3 : 1–4, 6–7, 10–11.

A popular account by the Head Pathologist in Charge, Special Rubber Project, Bureau of Plant Industry, United States Department of Agriculture, of the attempt to develop the rubber plantation industry in the Western Hemisphere. It is mentioned that leaf disease is being attacked by using tolerant Hevea seedlings and by breeding for more resistant ones.

1066. Blandin, J. J. 633.912–2.4–1.521.6:575(72.86)
Why rubber is coming home.
Agric. Amer. 1941 : **1** : No. 4 : 1–7, 10.

In this popular article a short account is given of breeding for increased yield in rubber. It is also stated that the Goodyear Plantations Company are breeding for resistance to leaf disease. The disease resistant parents are the 3,600 trees still standing out of the 36,000 originally planted on a site in the centre of the disease in Costa Rica. These trees are being crossed with high yielding trees from the Middle East.

FRUITS 634

1067. Parrott, P. J. 634:575
The Research Program of the Geneva Experiment Station.
Proc. 86th Annu. Meet. N.Y. St. Hort. Soc. 1941 : 248–60.

A very short account is given of the breeding of new varieties at this Experiment Station.

1068. 634:575:608.3(73)
Amerikanische Pflanzenpatente Nr. 336–353. (**American plant patents Nos. 336-353**).
Züchter 1941 : **13** : 68–69.
Includes descriptions of a new strawberry, a new navel orange, a lemon and a peach and their origins.

1069. 634.11:575.12(43)
Zwei Apfelneuzüchtungen für die Obstbaupraxis. (**Two new apples for horticultural use**).
Forschungsdienst 1941 : **11** : p. 122 (Abst.).
The Institute for Fruit Cultivation at Geisenheim has produced two new apples: the Erwin Junge (a hybrid of the White Winter Kalvill with Seedling No. 1 from the Landsberger Reinette) and Franz Späth, a hybrid of Minister von Hammerstein with the White Winter dessert apple.

1070. Tatarintsev, A. S. 634.11:575.183
(**Further notes on change of fruit form under the influence of foreign pollen**).
Jarovizacija 1940 : No. 5 (32) : 130–31.
Descriptions and illustrations are given of variations in fruit type on a single apple tree, apparently resulting from differences in the pollen.

1071. Stuart, N. W. 634.11–2.111–1.521.6:575
Cold hardiness of seedlings from certain apple varieties as determined by freezing tests.
Proc. Amer. Soc. Hort. Sci. 1941 : **38** : p. 315 (Abst.).
Progenies raised by open pollination from 31 different varieties and by controlled pollination (20 crosses) were subjected to controlled freezing tests. Both types of progeny were highly variable. Although progenies from different varieties differed in their degree of resistance, this could not be closely associated with the hardiness of the parent.

1072. 634.13:581.162.3
Botez, I. 634.13:576.356.5
Felul de a se comporta în procesul de fecundare a câtorva varietăţi de păr. (**The behaviour of certain pear varieties in the process of fertilization**).
Anal. Inst. Cerc. Agron. Român. 1938 (1939) : **10** : 395–415.
Only 2 self-fertile varieties, Beurré Bosc and Beurré Gens, were found. The various kinds of sterility encountered are described and the behaviour of each of the varieties studied is discussed. By their seed production and behaviour as pollen or maternal parents the varieties Curé, Beurré Diel, Beurré Liegel and Duchesse d'Angoulême are presumed to be triploid. All other varieties examined were diploid.
In certain crosses the fruit weight of the hybrids was higher than the average of the two parents.

1073. Lammerts, W. E. 634.21:581.143.26.03:575.247
A Royal apricot sport of short chilling requirement: origin and transmission of characteristics to seedlings.
Proc. Amer. Soc. Hort. Sci. 1941 : **38** : 175–78.
The winters of coastal Southern California are usually too mild for normal leafing and fruiting of the apricot. A bud sport of the variety Royal, called Early Royal, has low chilling requirements, being relatively unaffected by mild winters. It has a rather poor bearing habit and has therefore been crossed with other varieties and also selfed, to see whether its low chilling requirements are inherited. The results indicate that the low chilling requirements are dominant in inheritance and that the sport is heterozygous. Further studies are needed for a full factorial analysis. Since the results so far obtained suggest that the low chilling requirement can be combined with better fruiting habit, the sport may prove valuable as a basis for developing apricots adapted to mild winter regions.

1074. KRUFT, F. 634.22:575.42(43)
Die Selektion bei der Deutschen Hauszwetsche. (Selection applied to the German Zwetsche).
Dtsch. Obstbau 1940 : No. 9 : 169–71.
[From Forschungsdienst 1941 : **11** : p. *16*].

Numerous types of late ripening Zwetschen have in Germany come to be included under the name "Deutsche Hauszwetsche" and incidentally many inferior forms have crept in owing to the use of infested forms from root shoots that have not been selected according to the yield of their parent trees.
The Geisenheim Institute for Fruit Cultivation therefore began to collect and record all the better types that are superior in yield, quality or resistance to disease or cold. Already 1209 specimens from various parts of the country have been gathered and they are to be studied as grafts.

1075. WEEKS, W. D. 634.22:576.312.35
Chromosome number of the beach plum (*Prunus maritima*).
Proc. Amer. Soc. Hort. Sci. 1941 : **38** : p. 141.

In the root tips of seedlings of *P. maritima* $2n = 16$ chromosomes were found. It is suggested therefore that this species will be more easily crossed with *P. americana* and *P. salicina*, which are diploid species, than with *P. domestica* and *P. insititia* which are hexaploid ($2n = 48$).

1076. FLORY, W. S. (jun.) 634.22:581.331.2:575.127.2
Pollen studies with plums representing certain species and interspecific hybrids.
Proc. 42nd Annu. Conv. Ass. Sth. Agric. Wkrs, Atlanta, Ga., February 5–7, 1941 : 171–72.

The percentage good pollen (normal sized grains which stain easily) and the size of pollen grains were determined for 16 pure species derivatives, 18 species hybrids and 5 varieties of unknown origin.

1077. 634.23:575(74.8)
Partners produce new York Imperial Cherry.
Amer. Fruit Gr. 1941 : **61** : No. 3 : p. 33.

The York Imperial sweet cherry has been patented by H. B. Faber and J. A. C. Ziegler of York, Pennsylvania. It is a cross between the sweet cherries Napoleon and Schmidt and is claimed to be hardy, self-pollinating and prolific, with cherries excellent for eating, canning and shipping.

1078. MITTMANN-MAIER, G. 634.23–2.421.6–1.521.6
Untersuchungen über die Moniliaresistenz von Sauerkirschen. (Investigations on the *Monilia* resistance of sour cherries).
Z. PflKrankh. 1940 : **50** : 84–94.

A knowledge of the *Monilia* resistance is important in breeding for resistant types of fruits. Experiments made at the Institut für Obstbau at Geisenheim with floral infection of sour cherries, showed that the strains of *Monilia cinerea* and *M. fructigena* used differed in virulence on cherries whether owing to the presence of geographical races of the fungi or to specialization of some of the fungi for particular species of fruits is not known.
In further experiments with 5 strains obtained from the same two species, Grosser Gobet proved particularly resistant and Kaiserin Eugenie and Harlemer also showed good resistance. The most susceptible varieties were Frühe Ludwigs, Gubens Ehre and Exz. Hindenburg.
No host specialization was found with the *Monilia* strains used, but the possibility of physiological specialization resulting from differences between the *Monilia* species or perhaps also between strains within one species must be taken into consideration.
Special study was devoted to the problem of technique.

1079. BLAKE, M. A. 634.25:575
An acquaintance with peach varietal types is essential in peach breeding to secure improved varieties.
Proc. Amer. Soc. Hort. Sci. 1941 : **38** : 144–47.

The author describes briefly a number of types of peach varieties. He claims that a knowledge of these types and their inheritance is more helpful in breeding work with peaches than a genetical study of the progenies by statistical methods.

1080. Marani, M. and Gerbaldi, C. 634.25:575(45)
Sei varietà di pesco raccomandabili. (**Six recommended varieties of peaches**).
Riv. Frutticult. 1940 : **4** : 113–23.
Brief descriptions and illustrations of the following varieties are given:—Lacroix 3, Arkansas, Madame Kira Evreinoff, Charles Ingouf (Vincitore), Incomparabile Guilloux (Guilloux No. 1), Guilloux 2 (Madame Guilloux 2). These six varieties will ensure an uninterrupted supply of fruit during the period July 6–August 12. R. M. I.

1081. Cosmó, I. 634.25:575.247:634.256
Tre casi di probabile mutazione gemmaria osservati su piante di pesco. (**Three cases of probable bud mutation observed in peach plants**).
Riv. Frutticult. 1940 : **4** : 125–34.
The first two bud sports described were found on a tree of the variety locally known as Rossetto and affected only the fruits. On two branches were four nectarine fruits. These fruits were large, about 5·5 cm. in diameter, rounded in shape with a rib along the median furrow less accentuated than in the peaches of the same plant; a smooth skin of an intense wine-red on one side; flesh rather tender but with a tendency to the mealiness of the normal peach, white in colour, lightly veined with red near the stone, acid in flavour and separating easily from the stone. The stone itself was identical with that of the peach. Attempts to propagate the abnormal branch failed. The third case occurred on a tree of the Veronese variety "Fogado". It was not, however, found possible to follow completely the development of this one nectarine fruit. R. M. I.

1082. Dermen, H. 634.25:576.356.5:581.04
Simple and complex periclinal tetraploidy in peaches induced by colchicine.
Proc. Amer. Soc. Hort. Sci. 1941 : **38** : p. 141.
By colchicine treatment of germinating peach seeds simple and complex periclinal chimaeras of diploid and tetraploid tissue have been produced.

1083. Blake, M. A. 634.25–2.111–1.521.6
Some present day problems and essentials in peach production and marketing.
Proc. 74th Annu. Meet. Ohio State Hort. Soc. 1941 : 87–92.
Notes on hardiness of peach varieties.

1084. Lantz, H. L. and Maney, T. J. 634.25–2.111–1.521.6:575.127.2
Peach breeding : a study of inheritance in some cross-bred seedlings.
Proc. Amer. Soc. Hort. Sci. 1941 : **38** : 184–86.
Trees of *Prunus Davidiana* are very resistant to low temperatures, having been known to withstand —35 to —40° F., but the flower buds are usually killed. It has transmitted this type of resistance and also resistance to *Bacterium pruni* in F_1 and back-cross hybrids with peaches. Winter-hardy flower buds have been found in open-pollinated seedlings descended from the variety Hill's Chili and also in a seed-propagated strain from Boone, Nebraska. There appear therefore to be possibilities of breeding peach varieties capable of withstanding the severe winter conditions of the Upper Mississippi Valley. Crosses have been made between peach x *P. Davidiana* seedlings and Hill's Chili seedlings to see whether hardiness of tree and hardiness of flower bud can be combined.

CITRUS FRUITS 634.3

1085. Zorin, F. M. 634.3:575.257
(The seed progeny of a vegetative hybrid of Shiva-Mikan with the Citrangequat).
Jarovizacija 1940 : No. 5 (32) : 128–29.
A bud of the mandarin Shiva-Mikan was inserted into the Citrangequat; when the branch arising from it was 25 cm. in length its upper end was grafted on to an upper branch of the

Citrangequat, the Shiva-Mikan branch being thus inserted between two branches of the stock. All its leaves were removed as they formed and the flowers were bagged and allowed to self-pollinate. The fruits formed resembled those of the Citrangequat stock more than those of the mandarin and the one seedling that was obtained formed leaves with a strong tendency to become tripartite and resembled the Citrangequat in colour and habit.

1086. Sokolskaja, V. P. 634.3:581.163:578.08
(Parthenocarpy as a result of pistil removal in flowers of citrus species).
Proc. Lenin Acad. Agric. Sci. U.S.S.R. 1940 : Nos. 23–24 : 12–16.

Citrus flowers were subjected to various treatments, as follows: (1) pollination with foreign pollen, (2) self-pollination, (3) emasculation without pollination, (4) removal of the stigma, (5) removal of the style and (6) natural pollination. The largest set of fruit was obtained in the experiments with the styles removed; these fruits were all seedless and larger than the normal fruit. The method was therefore applied to 8 orange trees, 2 mandarins, 1 lemon and 1 grapefruit. All produced seedless fruit and in much larger quantity than the control trees open-pollinated. Thus the 3 experimental oranges produced 443 more fruits than the 3 controls, and the 2 experimental mandarins 582 more than the controls. The seedless fruits were sweeter, less acid, more tender, contained more vitamin C and ripened earlier. The method is being recommended to the collective farmers and is thought to be of possible interest for other crops too.

1087. Frost, H. B. 634.322:575.127.2:634.323
The Pearl tangelo—a new citrus variety.
Calif. Citrogr. 1940 : **25** : p. 346.

A description is given of the tree and fruit of the Pearl tangelo, produced at the Citrus Experiment Station, Riverside, California by pollinating the Imperial grapefruit by Willow Leaf mandarin. It is recommended for small scale trial in the inland citrus areas of California because of its good fruit characters, especially its flavour.

1088. Friend, W. H. and
Yarnell, S. H. 634.323:581.165.1:575.42
Clonal selection of grape fruit with respect to yield.
Proc. Amer. Soc. Hort. Sci. 1941 : **38** : 358–62.

The yields of trees raised from budwood of low- and high-yielding trees of Marsh and Thompson grapefruit were compared in a replicated trial. It is concluded that this type of selection was ineffective.

VARIOUS SMALL FRUITS 634.4

1089. 634.418:575.127.2
Zimmerman, G. A. 634.41:575.127.5
Hybrids of the American papaw.
J. Hered. 1941 : **32** : 83–91.

The horticultural value of the American papaw (*Asimina triloba*) is stressed. Named varieties exist, some of them dating back to a contest run in 1916. The author has a collection of varieties, seedlings and related species and has made interspecific crosses, from which seedlings with attractive flavour have been obtained. A common defect which may be remediable by breeding is inability to set fruit without hand pollination.

Fruits have been obtained by pollinating the papaw with the related genus *Annona* but the F_1 had not been grown at the time of writing. It is hoped also to use interspecific hybrids for crossing with *Annona*.

NUTS 634.5

1090. Kline, L. V. and
Chase, S. B. 634.512:575
Compilation of data on nut weight and kernel percentage of black walnut selections.
Proc. Amer. Soc. Hort. Sci. 1941 : **38** : 166–74.

The nut weight and kernel percentage of 212 selections of *Juglans nigra* are tabulated.

1091. Farrior, J. W. and
Middleton, G. K. 634.58:575.42
The improvement of Virginia type peanuts by mass selection.
Proc. 42nd Annu. Conv. Ass. Sth. Agric. Wkrs, Atlanta, Ga., February 5–7, 1941 : p. 102.
On the basis of results obtained in an experiment it seems doubtful whether any marked improvement in yield can be obtained by mass selection within stock Virginia type peanuts.

1092. Higgins, B. B. 634.58:581.48:575.11.016.6
Inheritance of seed-coat color in peanuts.
J. Agric. Res. 1940 : **61** : 745–52.
The testa colours of the varieties used were red, flesh or white. Flesh colour is dominant to white giving a 15: 1 ratio. Red is dominant to flesh giving a 3: 1 ratio; the flesh pigment must be present before red can develop. The two white varieties used had different genotypes. Philippine White has the red and flesh factors in the recessive condition but carries a pair of dominant duplicate factors necessary for the development of colour; Pearl lacks the latter factors but carries the dominant factors for red and flesh.

SMALL BUSH FRUITS 634.7

1093. Fischer, H. E.,
Darrow, G. M. and
Waldo, G. F. 634.71:576.356.5:581.162.5
Further chromosome studies of some varieties of blackberries.
Proc. Amer. Soc. Hort. Sci. 1941 : **38** : 401–04.
The chromosome numbers of 25 so-called blackberries are listed, including some selections of the wild trailing blackberry of the Pacific Coast (*R. macropetalus* Doug. and related species). The numbers found were diploid ($n = 7$), pentaploid, hexaploid, heptaploid, octoploid, nonaploid and dodecaploid.
Two recently named varieties, Pacific and Cascade, obtained by crossing a dodecaploid selection from Oregon with the Loganberry (hexaploid) were found to be nonaploid. Since they are fertile enough to be considered commercial varieties it is argued that in these high degrees of polyploidy numerical hybridity has little effect on fertility. Similarly in breeding work at Corvallis, Oregon, 124 selections have been made from crosses between plants with different chromosome numbers. On the assumption that only reduced gametes functioned all these selections except two would be expected to have odd chromosome numbers, yet they were sufficiently fertile to have been selected for further testing.

1094. Bailey, L. H. 634.71:582(7)
Species Batorum. The genus *Rubus* in North America (north of Mexico).
Gentes Herbarum, N.Y. 1941 : **5** : 1–64.
The problems of *Rubus* systematics are considered in the first part of this monograph. It is pointed out that previous investigators have often described specimens that cannot be referred to any species as hybrids. Also only good full-size specimens should be preserved as herbarium material. Descriptions are then given of the North American species belonging to the four subgenera, *Chamaemorus*, *Cylactis*, *Chamaebatus* and *Eubatus*. The two subgenera, *Idaeobatus* (Raspberries) and *Anoplobatus* (flowering raspberries) are not considered. Fifteen species are described in the subgenus *Eubatus* (the true brambles, or blackberries and dewberries). These include *R. caesius* (European dewberry), *R. vitifolius* variety *titanus* (Mammoth blackberry), *R. ursinus* (Santiam blackberry; a parent of the loganberry), *R. ursinus* variety *loganobaccus*, the youngberry and the boysenberry. It is also suggested that the loganberry is not a hybrid between the raspberry and *R. ursinus* but is just a form of the latter.

1095. Slate, G. L. 634.711–2.8–1.521.6:575
Raspberries.
Proc. 86th Annu. Meet. N.Y. St. Hort. Soc. 1941 : 274–78.
Mention is made at the end of this paper of the New York State Agricultural Experiment Station's raspberry seedling No. 13618. This seedling is the result of a cross between Lloyd

George and Newburgh made in 1937. It has been grown for seven years among mosaic infected material without a single plant becoming infected. It ripens late and produces very good berries. It will be named and introduced as soon as stocks are large enough.

1096. Tolmačev, I. A. 634.72:575.127.5:634.725
(An experiment on overcoming incompatibility).
Jarovizacija 1940 : No. 5 (32) : 125–26.

The Krandal' currant (*Ribes odoratum* Wendl.) was pollinated with various gooseberry varieties and mixtures of pollen, after having cut off the stigma and part of the style of the maternal parent, the style of which is otherwise too long to permit of effective fertilization. Seed was obtained only from pollination with pollen mixtures. The operation of cutting off the stigma alone did not result in the set of parthenocarpic fruit. Of the 6 seedlings that survived 5 were intermediate in character and 1 was matroclinous. The spine development in the hybrid plants varied according to season, being more pronounced under dry conditions and almost absent under wet.

1097. Pilin, G. M. 634.725:575.3
(An experiment on changing the nature of the gooseberry).
Jarovizacija 1940 : No. 5 (32) : 129–30.

Among the gooseberry hybrids between the varieties Krupnyi [Large] x Houghton one seedling appeared which was very productive, very resistant to *Sphaerotheca*, and very early but bore small berries not much larger than Houghton. Cuttings were taken from it and reared under the most favourable possible conditions. The berries borne on the resulting plants were much bigger and the improvement is said to have been maintained in cuttings from them.

1098. S.....i. 634.725:575.42(43)
Neue Stachelbeersorten. **(New varieties of gooseberries).**
Land u. Frau 1940 : **24** : p. 33.

Mauks früheste Rote [= Mauks Earliest Red] and Lauffener Gelbe [= Lauffen Yellow] are two varieties claimed as new that are specially recommended as resistant to sulphur treatment for mildew.

The first named is a red berried form obtained from a May Duke seedling. It surpasses May Duke in vigour and quality and ripens 10–12 days earlier.

Lauffener Gelbe is a yellow gooseberry from a seedling of Pilot. It has a vigorous erect habit and surpasses Triumphant in yield. Its fruits stand transport exceptionally well.

The flavour of the berries of both is good and they are suitable for jam or can be eaten uncooked.

1099. 634.725:575.42(48.5)
Nilsson, F. 634.75:575.42(48.5)
Några erfarenheter och intryck av trädgårdsodling i Norrland. **(Some discoveries and impressions of horticulture in Norrland).**
Fruktodlaren 1940 : No. 1 : 16–19.

Under the severe winter conditions of Norrland only the small fruited varieties of gooseberry that have been cultivated from wild bushes are completely hardy and produce well. These wild type varieties have small hairy berries which may be either green or red. The bushes are low and the annual shoots do not grow very long. The leaves are rather thick and the branches have numerous sharp thorns. There is much variation in these wild forms and some are resistant to mildew. One such combination of hardiness and resistance is being propagated and subjected to further trials at the Horticultural School for Norrland [Norrland's Trädgårdskola] at Sörâker. The small fruited, hairy variety Scania too was selected at Alnarp for mildew resistance but it is still under observation to test its hardiness.

From crosses between the Norrland hardy, mildew resistant type and the English large fruited varieties of better quality it should be possible to produce a good variety suitable for Norrland conditions.

As regards strawberries, the varieties Stella, Inga and Luna which were produced at Alnarp seem to be hardy and very promising as material possibly suitable for Northern Sweden. Stella, in particular, which has dark wine-coloured fruits of very good flavour appears to be vigorous and productive and well worth further investigation.

1100. Duis, W. H. 634.73:575(75.5)
Selection of the low-bush blueberry in West Virginia.
Proc. Amer. Soc. Hort. Sci. 1941 : **38** : 434–37.
Large quantities of fruit are picked annually from wild blueberries in West Virginia and attempts are now in progress to improve them by selection. The wide variation to be found in *Vaccinium angustifolium* Ait. and *V. pallidum* Ait. is briefly described in this article.
Other species indigenous to West Virginia which might be used in a breeding programme are *V. canadense* Kalm, *V. stamineum* L., *V. erythrocarpum* Michx. and *V. Constablei* Gray.

1101. 634.73:576.356.5
Newcomer, E. H. 634.73:576.312.35
Chromosome numbers of some species and varieties of *Vaccinium* and related genera.
Proc. Amer. Soc. Hort. Sci. 1941 : **38** : 468–70.
Observations were made at meiosis. In five selections of *V. pennsylvanicum* 24 pairs with regular pairing and disjunction were observed. The same number was observed in 13 varieties of *V. corymbosum*, including one F_1 hybrid with *pennsylvanicum*; secondary pairing was found in four varieties and in three of these there was some lagging of chromosomes. The variety Rancocas was found to have a ring of four chromosomes, evidently due to its origin by interspecific crossing.
The *V. atrococcum* variety, Orvis Williams, was found to have 24 pairs; this species had previously been reported as diploid ($n=12$). *V. Vitis-Idaea, V. stamineum* and *V. vacillans* were found to be diploid and *V. oxycoccus* hexaploid ($n=36$). In related genera the following numbers were found: *Gaylussacia baccata* $n=12$, *Bruckenthalia spiculiflora* $n=18$, *Gaultheria procumbens* $n=12$.
Since it appears that close chromosome homology exists in different species, the author suggests that wider crossing might be attempted in the breeding of blueberries.

1102. Clark, J. H. 634.73:582:581.45
Leaf characters as a basis for the classification of blueberry varieties.
Proc. Amer. Soc. Hort. Sci. 1941 : **38** : 441–46.
The value of leaf measurements and characters for classifying blueberry varieties has been studied, using a specially constructed gauge which measures the length, width, apex angle and base angle. Pressed and dried leaves can be used and though environmental conditions affect the measurements they do not cause serious inconsistencies.
A tentative diagnostic key is given, based on leaf margin (entire or serrate), lower surface (glabrous or pubescent), width to length ratio and apex and base angles.

1103. Petrov, A. V. 634.75:575(47)
(New varieties of strawberry).
Sady i Ogorody (Fruit and Vegetable Gardens) 1941 : No. 2 : 53–54.
In the third generation of the cross Čudo Ketena [?Caton's Wonder] x Roščinskaja forms with both very early and very late maturity have segregated, also forms with high yield and varying colours of flesh. By selection among the segregates the following new varieties have been created: Kometa, a very late ripener; Samorodok, very high yielder; Jubileinaja [Jubilee] with red flesh; Progress, etc., etc. Descriptions of these and a number of other new varieties are given.

1104. Darrow, G. M. 634.75:575(73)
Strawberry varieties old and new.
Amer. Fruit Gr. 1941 : **61** : No. 3 : 11, 22.
The position of ten leading varieties in the U.S.A. is reviewed and notes are given on sixteen new varieties.

1105. Duka, S. Kh. 634.75:575.127.2
(New forms of hybrids between *Fragaria grandiflora* and *F. elatior*).
Jarovizacija 1940 : No. 5 (32) : 131–32.
Plants of the cultivated strawberry (*F. grandiflora*), variety Späte von Leopoldshalle were pollinated with *F. elatior* and gave rise to over 300 mature hybrids. Some of them resembled

one parent, some the other and some were intermediate; the intermediates were partially sterile and bore irregularly shaped fruit. The fruits of the maternal types were improved in flavour and more aromatic than the cultivated parent and since this parent was male-sterile are thought to be undoubtedly true hybrids.

1106. Hildreth, A. C. and
Powers, L. 634.75–2.111–1.521.6:575.127.2
The Rocky Mountain strawberry as a source of hardiness.
Proc. Amer. Soc. Hort. Sci. 1941 : **38** : 410–12.

In breeding strawberry varieties for the Central Great Plains and the high valleys and plateaux of the Rocky Mountain region, a feature of which is the very severe winter conditions, attention has been paid at Cheyenne, Wyoming to the native Rocky Mountain strawberries (*Fragaria cuneifolia* Nutt). About 42,000 plants have been collected from over 1,100 localities and while these show great variation in horticultural characters, they are all winter-hardy.
F_1 hybrids of three different collections of *F. cuneifolia* with the commercial varieties Gem, Dorsett and Fairfax survived without injury winters which killed high proportions of the plants of the parent commercial varieties and badly injured the survivors. The F_1s were mostly intermediate in respect of other horticultural characteristics, but plants could be found which in different respects were as good as or better than the commercial varieties. The F_1s were quite fertile.
It appears that such crosses are likely to produce valuable winter-hardy varieties for the regions mentioned and may also be a means of improving cultivated strawberries in earliness, runner production, prolificacy, and sweetness, flavour and aroma of fruit.

1107. Dermen, H. and
Bain, H. F. 634.76:576.356.5:581.04
Periclinal and total polyploidy in cranberries induced by colchicine.
Proc. Amer. Soc. Hort. Sci. 1941 : **38** : p. 400.

The shoots of cranberry seedlings were immersed in 0·05, 0·1 and 0·2% colchicine solutions for 24 hours. Examination of stoma size some months after treatment indicated that polyploidy had been induced and cytological investigation of the growing branch tips showed that in some cases it was confined to the epidermis while others were totally polyploid. The totally polyploid plants had the typical characters of polyploids. It is possible that some plants which had polyploid characters but stomata of normal size had diploid epidermis and polyploid inner tissue.
Polyploidy, detected by stomatal examination, was also induced by applying drops of colchicine solution to the tips of growing shoots.

VITICULTURE 634.8

1108. Constantinescu-Ismail, G. 634.835:575(49.8)
Selecţiunea în viticultură cu privire specială la varietăţile Româneşti. (**Selection in viticulture with particular respect to the Rumanian varieties**).
Anal. Inst. Cerc. Agron. Român. 1938 (1939) : **10** : 416–34.

The realization of the damage done to Rumanian vineyards by indiscriminate introduction of varieties from abroad has led to the present study of 12 of the best Rumanian varieties and 12 imported varieties, each grafted on 10 different rootstocks. Most Rumanian varieties are mixed populations consisting of variants that have probably arisen in the course of the years by mutation. It would seem probable therefore that by mere selection it should be possible to select from them varieties better than the existing ones. Varieties mentioned as requiring selection are Grasa, which is low in yield, Feleasca alba, low in fertility, Frâncuşa (=Riesling românesc), a vine of excellent quality but irregular in bearing, Crâmpoşia, a raisin variety with crisp berries, which suffers much reduction in yield on account of floral defects, Braghina, an excellent quality wine variety but variable in yield, and Negru-vârtos (=Corb). The position is much the same in many other Rumanian varieties.
Special selection experiments have been carried out on the varieties Braghina and Negru-vârtos. Examinations were made of vines growing on different rootstocks and under different conditions of pruning. In 1933, 1934 and 1935 general observations were made on time of flowering and of type of flower in any deviating forms. Thus in 1934 in 10 plots of Braghina

comprising 750 vines, 96 of them had star-shaped hermaphrodite flowers; only 36 of these gave fruit and the rest were completely sterile. Other plants bore bunches with hermaphrodite flowers of the female types and these were all sterile. In Negru-vârtos female and normal hermaphrodite flowers occurred and among the latter there appeared a certain number of incompletely developed flowers.

Negative selection was carried out by eliminating the plants with unproductive bunches. Records have also been made of the number of bunches per plant, total weight of berries, acid content of the must, alcohol percentage, etc. By this means it has been possible to select a very small number of superior stocks for multiplication as pure lines. In 1937 from 1,500 vines of Braghina and Negru-vârtos, representing 20 combinations of rootstocks and 5 combinations of pruning, 684 productive and 786 unproductive were selected; of the productive plants 466 were of the variety Braghina and only 218 of Negru-vârtos. If the results of four successive years are taken together however the number of productive varieties is reduced very much further. Thus in a plot of Braghina grafted on Riparia Gloire, out of 49 vines classed as productive in 1937 only 6 are good in the four successive years, namely Nos. 5, 15, 20, 65 and 70; and of 15 plants of Negru-vârtos on Riparia x Rupestris 3309 classed as productive in 1937 only 3 have been good every year and retained for multiplication: namely Nos. 5, 17 and 19. Similar results were obtained with Braghina and Negru-vârtos grafted on other root-stocks.

It is recommended that the first three years should be devoted to negative selection, inspection for impurity being made at the time of the bursting of the buds, at flowering, at ripening time and at harvest; positive selection for type, yield and composition of must, etc., will be made in the fourth year and confirmed in the fifth when the best lines will be multiplied vegetatively. The actual work of multiplication can begin as early as the third year.

1109. Kuzmin, A. J. 634.835:581.162:575.3
"Training" of grape seedlings.
Bull. Acad. Sci. U.R.S.S., Sér. Biol. 1940 : No. 5 : 802–09.

Seeds from Michurin varieties crossed with early maturing varieties were sown at such a time that the seedlings appeared not before the middle of June and not later than the beginning of July. Up to the time of sowing the seeds were kept in moist sand at a temperature just above 0° C. The seedlings were carefully tended and preserved from the effects of frost in the first winter, since experience has shown that even very hardy forms may be damaged at this stage. In the second year the seedlings were planted out into their permanent positions, without any previous pricking out. The side shoots were removed during the growing period but the two main shoots were left untouched. In this way, by fostering the shoots that are phasically most advanced, it was possible to induce fruit bearing after three years in F_2 seedlings of the cross Chasselas x Rupestris du Lot, from 1510 seedlings of which one has been selected; fruiting was induced after two years in second generation seedlings from free pollination of the variety Russian Concord, one of which has been selected from a total of 459 seedlings. In a number of other crosses the seedlings fruited in the fourth year. One seedling has been selected from the cross Čauš x Rupestris du Lot.

1110. Billeau, A. 634.835:581.165.711
Experienţe şi cercetări asupra înrădăcinării port-altoilor Americani şi Europeo-Americani. (**Experiments and researches on root formation in American and European-American rootstocks**).
Anal. Inst. Cerc. Agron. Român. 1938 (1939) : **10** : 464–72.

The American varieties differ in the ease with which they take root. The characteristics of the different species are described. Among the most difficult are *Vitus Berlandieri*, which is immune to phylloxera, and *V. cordifolia*, which is unusually drought resistant and will grow in soils where no other species will survive. These two species have therefore been crossed with a number of other species.

All the hybrids are possessed of satisfactory rooting capacity while retaining the characteristic features of the species. Improvements in rooting capacity have also been obtained by selection amongst F_2 plants produced either by selfing F_1 hybrids or intercrossing them. Thus in 1920 flowers of Berlandieri Rességuier Nr. 1 were fertilized with pollen from Berlandieri x Riparia 420–A; the seeds were sown in 1921 and selection was carried out in that and successive years, so that in autumn 1926 there remained 9 selected plants, of which 7 bore

hermaphrodite flowers and 2 male flowers (a character inherited from 420–A). In rooting tests in 1927 these plants gave a success of 15–20%.
The 7 hermaphrodite plants were selfed in 1927 under bags and the seed was sown in 1928. After further rigorous selection there now remain 3 ten year old plants. Though they show considerable differences one from the other, their morphological and vegetative characters are distinctly those of Berlandieri Rességuier Nr. 1. Their rooting capacity however is much better than that of the Berlandieri parent or the F_1 plants. Thus the success in tests in 1937 was 45% in F_2 hybrid 12–1.B, 49% in 13–1.B and 44% in 13–3.B, compared with 3% for Berlandieri Rességuier Nr. 1.
In view of their origin, the phylloxera resistance and grafting capacity of these plants is regarded as beyond question but their influence on the yield and quality of the scion remains to be tested.
Various experiments on indirect rooting of these two species are also described.
The results of rooting tests on 30 of the best known rootstocks are given, the best being 101–14 and Rupestris Brignais with 99 and 98% success respectively, and the worst Berlandieri Rességuier Nr. 1 with 3%.

1111. Teodorescu, I. C. 634.835:582(49.8)
Clasificarea şi recunoaşterea soiurilor de viţe roditoare din podgoriile Româneşti. (**Classification and identification of varieties of vines of Rumanian vineyards**).
Anal. Inst. Cerc. Agron. Român. 1939 (1940) : **11** : 222–37.
From a study made by the staff of the Viticultural and Horticultural Section of the Institute of Agricultural Research to determine the 240 varieties of vines in the collections of the Bucharest Agricultural Faculty and the Viticultural Station of the Institute, a classification has been devised for the identification in connexion with breeding operations and the creation of new regional collections. Among the criteria adopted are colour of the berry, shape of the cluster and berries, taste, botanical features of the flower, development of the leaf, morphological characteristics of the full grown leaf and colour of the shoots.

1112. Tuneu, R. and Guerra, A. 634.835:582(89)
Primera contribución al estudio ampelográfico de las variedades de vid cultivadas en el Uruguay. (**First contribution to the ampelographic study of the vine varieties cultivated in Uruguay**).
Rev. Fac. Agron. Univ. Montevideo 1940 : No. 22 : 67–106.
Vegetative and fruit characters were studied in a number of varieties and these are classified as "recommended", "worth trying" and "not recommended". Descriptions are given of the varieties, with indications of synonyms and origin, where known. The varieties are also illustrated.

FORESTRY 634.9

1113. Jablokov, A. S. 634.97:575
(**Pro Darwinism in breeding woody forest trees**).
Lesnoe Khozjaistvo (Forestry) 1940 : No. 4 : 75–77.
The author recommends the selection of the most promising individuals of a given species, growing these individuals under the most favourable conditions, allowing them to interpollinate and using the seed so obtained for planting. Experimental evidence of the advantage of this method is cited from the work of Darwin, Michurin and Lysenko and from the author's own work with walnuts, hazels and poplars.
Observations of the author are quoted in support of Lysenko's statement that cross-pollination sometimes produces progeny which are more vigorous than the parent though conserving the maternal type.

1114. 634.972.3:575.127.2
Viaje de estudios silvícolas en Europa del Ing. Agr. Lucas A. Tortorelli.
(**Study tour on forestry in Europe by Lucas A. Tortorelli**).
Rev. Argent. Agron. 1940 : 7 : 141–43.
Passing reference is made to work on the genetics of poplars seen at the Instituzione per il

miglioramento del pioppo di Torino (Turin Institute for poplar improvement), under J. Jacometti and G. Piccarolo; the former has produced the hybrid Arnaldo Mussolini (*Populus canadensis* x *P. nigra* var. *Stela*).

1115. Welch, D. S. and Collins, D. L. 634.972.8–2.421.9–1.521.6
Dutch elm disease and its control.
Cornell Ext. Bull. 1940 : No. 437 : Pp. 19.
It is mentioned that the Asiatic species, *Ulmus pumila* L. and its variety *pinnato ramosa*, and a seedling of *U. foliaceae* originally designated as No. 24 but now known as *Ulmus Christine Buisman* appear to be resistant to Dutch elm disease.

1116. Albensky, A. V. 634.975:575.127.2
Specific characters in F_1 of the inter-specific Larix hybrids.
Proc. Lenin Acad. Agric. Sci. U.S.S.R. 1940 : Nos. 23–24 : 20–23.
Hybrids of *Larix decidua* Mill. x *L. Kaempferi* Sarg. at the age of 5 years showed considerable heterosis; 55·2% were between 150 and 200 cm. in height and a further 10·4% exceeded 200 cm. The same was true of hybrids of *L. sibirica* Ledeb. x *L. Kaempferi*, where the figures were 48·7% and 21·0% respectively. Of the 8 corresponding seedlings of *L. decidua* only 1 was as high as 176 cm. and the others were considerably smaller.
The trunk was quite straight in the majority of the hybrids of *L. sibirica* x *L. Kaempferi* whereas in the other cross half the hybrids had bent trunks. The crown was classed as wide in the majority of the hybrids and the replacement of the main axis by lateral axes when killed was in most hybrids satisfactory.
The purple colour of the annual shoots of *L. Kaempferi* was dominant in all but about 15% of the hybrids. The shoots were pubescent in almost all hybrids.
In the hybrids of *L. decidua* the needles were green in 20·6% of the hybrids, grey in 75% and intermediate in 4·4%. In the *L. sibirica* cross the figures were 19·5: 71·4: 9·1%.
The characters of the paternal species *L. Kaempferi* that predominate in the hybrids are thus the wide crown, the colour of the young shoots and the grey colour of the needles. Other characters of this species, such as the susceptibility of the young shoots to frost damage and the formation of an umbrella-like crown owing to the dying off of the main shoot and the failure of the lateral shoots to replace it, appeared in certain of the hybrids but were by no means dominant.

1117. Skinner, H. T. 634.975:575.2
The origin of horticultural forms in cultivated conifers. Exhibit of the Morris Arboretum at the Philadelphia Spring Flower Show.
Arboretum Bull. Ass. Morris Arboretum Univ. Pa 1941 : **3** : 51–52.
Examples of horticultural forms and varieties of conifers were shown in the above exhibit. Those mentioned in the article are *Thuja occidentalis globosa* (the Globe Arborvitae), *Taxus media Hatfieldi* (*T. cuspidata* x *T. baccata*), the Dwarf Alberta Spruce (a seedling mutation) and the very low Maxwell spruce (a bud sport). Seed or bud mutations are said to be common in conifers.

1118. Haupt, A. W. 634.975:576.312.35
Oogenesis and fertilization in *Pinus lambertiana* and *P. monophylla*.
Bot. Gaz. 1941 : **102** : 482–98.
The chromosome numbers of these two *Pinus* species were found to be $n = 12$ and $2n = 24$.

1119. Jensen, H. and Levan, A. 634.975:576.356.5:581.04
Colchicine-induced tetraploidy in *Sequoia gigantea*.
Hereditas, Lund 1941 : **27** : 220–24.
Seeds of *S. gigantea* were germinated on filter paper moistened with 0·2% colchicine solution in petri-dishes. Most of the germinating seeds exhibited typical colchicine effects. One plant from the treatment was found to have the tetraploid number of chromosomes, $2n = 4x = 44$, in the whole of its root system. The chromosome number of control plants was $2n = 22$.

1120. 635:575(76·2)
CAMPBELL, J. A. 635·64–2.484–1.521.6:575(76.2)
Truck Crops Branch Station seeks answer to industry problems. Specialized research unit, though only two years in operation, has determined and published information vital to growers.
Miss. Fm. Res. 1940 : **3** : No. 11 : p. 1.

A greenhouse is under construction to facilitate varietal improvement work. Strains of tomatoes have been tested for resistance to wilt and breeding work is in progress with the aim of combining wilt resistance, high quality of fruit and suitability to Mississippi conditions.

1121. HARTMAN, V. 635.15:576.354.4:576.356.5
Cytologische Untersuchungen an Rettichen. (**Cytological investigations on radishes**).
Züchter 1940 : **12** : 120–22.

The flower buds of four plants taken from each of 40 cultivated varieties of radish were cytologically investigated.

All but one showed the same regularity in the reduction divisions, with 9 bivalents more or less clearly seen. The exception showed in the pollen mother cells 9 univalents besides the 9 bivalents. As a result, the tetrads had 5–9 chromosomes extra. This plant must be regarded therefore as a sterile, triploid hybrid.

R.M.I.

1122. 635.25:575.127.2:576.356.5:576.354.4
The cytology of the species hybrid *Allium Cepa* x *fistulosum* and its polyploid derivatives.
Hereditas, Lund 1941 : **27** : 253–72.

The morphology and meiotic behaviour of the F_1 and F_2 generations of the cross *A. Cepa* x *fistulosum* are described. Two of the F_2 plants are triploids and four quasi-tetraploids. The tetraploid F_2 plants have a much higher pollen fertility than the F_1 and the triploid F_2 plants. All the F_2 plants are, however, seed sterile. Pachytene studies of meiosis in the F_1 show that the chromosomes of *A. Cepa* and *fistulosum* are generally speaking homologous but that intra- and inter-chromosomal differences do occur. Inversions and multivalents were observed at first metaphase in the F_1. One triploid F_2 plant showed mostly trivalents at first metaphase. The variation in chiasma number between cells was rather pronounced. One tetraploid plant formed nearly all bivalents at first metaphase, i.e. it behaves as an amphidiploid. Occasional bridges were observed at anaphase but the meiotic irregularities were not great enough to explain the total seed sterility of the tetraploids. The tetraploids do show incipient development of numerous embryos and their sterility would thus appear to be diplontic and not haplontic. Localization of chiasmata is considered in the discussion.

1123. RICHARDSON, A. L. and
CURRENCE, T. M. 635.31:575.42
The relation of yield of staminate and pistillate asparagus plants to the rate of growth of progenies in the young stage.
Proc. Amer. Soc. Hort. Sci. 1941 : **38** : 613–17.

Using 3 pistillate and 6 staminate plants which had been recorded over a period of three years for number of spears produced annually, annual yield in ounces and mean size of spears produced, all the possible 18 crosses were made. Seed from these crosses was sown in two series and the days to emergence and fresh weight at $2\frac{1}{2}$ months after sowing were observed and subjected to variance analysis. There were no significant differences between the pistillate parents but one of the male parents was low in annual yield and number of spears produced annually.

The analysis of variance for the data on progenies showed that for days to emergence the mean square due to staminate parents was significantly large but not that due to pistillate parents. For weight at $2\frac{1}{2}$ months on the other hand the mean square for pistillate parents was significant but not that for staminate. In both cases however the mean square for interaction between staminate and pistillate parents was significant, suggesting that attention needs to be paid to parental combination in breeding this dioecious plant.

Time to emergence and early weight of progenies were not found to be correlated with annual yield, spear number or spear size of the parents of the cross.

1124. Jagger, I. C.,
Whitaker, T. W.,
Uselman, J. J. and
Owen, W. M. 635.52–2–1.521.6:575(79.4)
The Imperial strains of lettuce.
Circ. U.S. Dep. Agric. 1941 : No. 596 : Pp. 16.

Descriptions and pedigrees are given of the Imperial strains 2, 3, 6, C, F, 13, D, 152, 615, 847, 44 and 850. The stimulus for the development of the Imperial strains, with which the late I. C. Jagger was closely associated, was the need for lettuces for California and Arizona resistant to brown blight (cause unknown) and lettuce mildew (*Bremia lactucae* Reg.). Imperial 2, 3 and 6 are selections from New York Special, a crisp variety. New York or New York Special appears in the pedigree of all the Imperial strains. Imperial 13 and 44 have pedigrees involving White Chavigne (Blonde de Chavigne) and May King and the remaining strains were developed from crosses and back-crosses between New York or New York Special and the cos variety Blonde Lente à Monter.

1125. 635.54:575.42:581.143.26
Kvasnikov, B. B. 581.143.26.03:635.54
(Selecting chicory not subject to bolting).
Proc. Lenin Acad. Agric. Sci. U.S.S.R. 1940 : No. 20 : 3–9.

Vernalization at a temperature of + 1·5° C. caused the majority of plants in almost all strains of chicory to bolt, though the actual length of treatment required differed in different strains and in different plants; but a certain number of so-called "stubborn" plants remained unaffected and did not bolt however long they were vernalized. Progeny from these plants showed a much reduced percentage of bolting, even after vernalization. The progenies of "stubborn" plants from plots receiving intensive manuring were particularly free from bolters. The initial population of Silesian chicory gave 58·1% of bolting after 30 days vernalization, whilst the progeny required 65 days vernalization to give 55·3% bolting and certain other progenes required still longer. The "stubborn" plants are therefore forms with a very long vernalization phase. Some of them are long and some short as regards their photo-phase; those with a long photo-phase will be still more immune from bolting especially in southerly districts.
Many of the selections from these "stubborn" plants have proved quite high in yield and sugar content.

1126. Alekseeva, M. V. and
Prezent, I. 635.61:581.162.3
(Maintaining the varietal type in melons).
Jarovizacija 1940 : No. 5 (32) : p. 139.

The correspondent quotes cases of melons which though grown without isolation have produced pure progeny. Prezent replies that a certain amount of isolation is necessary, since such characters as aroma, flavour, etc., which interest the breeder, have no biological significance and will not be affected by selective fertilization on the part of the plant. Inbreeding on the other hand is not recommended.

1127. Hoffman, J. C. and
Brown, H. D. 635.611:575
Preliminary studies on a new muskmelon hybrid.
Proc. Amer. Soc. Hort. Sci. 1941 : **38** : 535–36.

A selfed musk-melon of the variety Perfecto had an unusually small cavity. From its seed a progeny was raised and crossed with Milwaukee Market as pollen parent. Data are here presented on the F_2 fruits. Over 99% had small cavities and they are distinguished also by firm texture and good quality. The foliage is resistant to the common diseases.

1128. Curtis, L. C. 635.621:575.125
Comparative earliness and productiveness of first and second generation summer squash (*Cucurbita Pepo*) and the possibilities of using the second generation seed for commercial planting.
Proc. Amer. Soc. Hort. Sci. 1941 : **38** : 596–98.

Continuing his earlier work (cf. "Plant Breeding Abstracts", Vol. X, Abst. 1149) the author has compared, in 5 x 5 Latin squares at two localities, the early yield and total yield from

Early Prolific Straightneck, Connecticut Inbred (C10), the F_1 and F_2 generations of the cross between them and finally the commercial variety Giant Summer Straightneck. As before, the F_1 gave large and significant increases in early yield over both parents and in this respect the F_2 was not far behind. In respect of total yield Early Prolific Straightneck and the F_1 and F_2 were about level, the inbred parent significantly behind. Giant Summer Straightneck was excluded from the analysis of variance. As judged by the date of appearance of the first female flower on individual plants the F_2 was slightly earlier than the F_1.
Since production of F_2 seed is much cheaper than F_1 the author suggests that in utilizing heterosis more attention might be paid to the F_2 generation especially in market garden crops where the product is picked before maturity and earliness and a range of picking times are more important than uniformity.

1129. MATTSON, H. 635.64:575(78.4)
"Bounty" tomato. Preliminary report and description.
Bi-m. Bull. N. Dak. Agric. Exp. Sta. 1941 : **3** : No. 3 : 11–14.
Bred at the North Dakota Agricultural Experiment Station from a cross between Albred and Break-o'-Day, Bounty is an early variety with determinate growth habit and deep, firm, smooth fruit of pleasant flavour. In variety trials it has exceeded all other varieties tested, both in total yield and yield of marketable fruit.

1130. YOUNG, P. A. 635.64:575.11
New genetic characters of the tomato.
Amer. Nat. 1941 : **75** : 280–82.
Three new genetic characters, sticky fruits, yellowish bordered leaves and an unusual double type of fruit are described. Sticky fruits and yellowish bordered leaves both appear to be recessives. The genetics of "puffing" has also been studied. In certain crosses the puff character was found to be dominant but it is not known how many factors are involved.

1131. BURGESS, I. M. 635.64:575.125
Hybrid vigor in some tomato crosses.
Proc. Amer. Soc. Hort. Sci. 1941 : **38** : 570–72.
A selection of Red River, distinguished by its earliness and resistance to cracking, was crossed with several commercial varieties and the resulting hybrid vigour as expressed in early yield of marketable fruit is given. The cross with Pritchard gave the best results and favourable reports have been received from some growers who tried the hybrid seed.

1132. MEYER, A. and
PEACOCK, N. D. 635.64:575.125
Heterosis in the tomato as determined by yield.
Proc. Amer. Soc. Hort. Sci. 1941 : **38** : 576–80.
The varieties Indiana Baltimore, Earliana, Nystate and Marglobe were crossed reciprocally in all combinations and all except Nystate were also crossed as seed parents with Bonny Best. In a replicated trial the F_1 hybrids were compared with the parents in respect of early and total yield, average weight of fruit and fruits per plant.
Indiana Baltimore was the highest yielding variety and was exceeded in total yield by several crosses, but not in early yield. Several crosses exceeded their parents in early and total yield. Nystate x Marglobe and Indiana Baltimore x Marglobe gave high total yield and should be of value for canning purposes. Marglobe x Earliana gave sufficiently high early yield to be useful for the fresh market.

1133. LESLEY, M. M. and
LESLEY, J. W. 635.64:576.356.4:581.163
Parthenocarpy in a tomato deficient for a part of a chromosome and in its aneuploid progeny.
Genetics 1941 : **26** : 374–86.
A very small tomato plant, which originated in an F_1 from dwarf parents, was found to be heterozygous for a deficiency. The plant formed little viable pollen but set fruit freely without artificial pollination. Most of these fruits were seedless or contained only one or two seeds. The seeds obtained from selfing the mutant gave 61 diploid, 6 trisomics, 1 tetrasomic and 4 very small plants which died before their chromosomes could be examined. No

plants like the original mutant occurred. The aneuploid progeny were relatively fruitful and had a tendency to parthenocarpy. In the trisomics the basal fruits tend to be parthenocarpic, fruits developed on later inflorescences are less likely to be parthenocarpic and apical fruits are generally seedy. Diploid plants also sometimes have a few basal parthenocarpic fruits. The tetrasomic set fruit without pollination but pollination was necessary for fruit setting in the trisomics.

1134. 635.64:576.356.5:581.04
NEWCOMER, E. H. 635.64:576.356.52:575.148
A colchicine-induced homozygous tomato obtained through doubling clonal haploids.
Proc. Amer. Soc. Hort. Sci. 1941 : **38** : 610–12.

Five dwarf tomato plants with short internodes and smaller leaves and flowers were examined cytologically; two of them proved to be haploid and were multiplied by cuttings. The plants thus obtained were treated with 0·4% colchicine in an aqueous emulsion of lanolin. By this method two diploids were obtained and seed has been collected from them. Theoretically this should give rise to completely homozygous lines.

1135. HARRISON, A. L. 635.64–2–1.521.6:575
Recent research on the control of tomato diseases.
Proc. 42nd Annu. Conv. Ass. Sth. Agric. Wkrs, Atlanta, Ga., February 5–7, 1941 : 164–65.

Mention is made of breeding for disease resistance in tomatoes. Especially rapid progress has been made in breeding for resistance to *Fusarium lycopersici*. An immune wild strain of *Lycopersicon pimpinellifolium* was used as the resistant parent. The work has been greatly facilitated by the discovery of a rapid method of testing tomatoes for wilt resistance. Hybrids highly resistant to spotted wilt have also been obtained.

1136. BAILEY, D. M. 635.64–2.6–1.521.6:578.08
The seedling test method for root-knot-nematode resistance.
Proc. Amer. Soc. Hort. Sci. 1941 : **38** : 573–75.

In the seedling test developed for testing the resistance of tomato varieties and species to *Heterodera marioni* (Cornu) Goody, 25 to 30 seedlings are raised in a two-inch pot in inoculated soil, cuprous oxide being used to control damping-off. No resistance has been found in a wide range of *Lycopersicon esculentum* (with three possible exceptions) or in *L. glandulosum*, *L. hirsutum* or *L. pimpinellifolium*. Resistant types have been found however in *L. peruvianum*.

1137. 635.65:575.2:581.47
TSCHERMAK-SEYSENEGG, E. von 635.65:575.2:581.48
Über einige selbst beobachtete Parallelvariationen der Samenschalenfarbe und Samenform bei Hülsenfrüchten. (**On some parallel variations observed by the writer in the colour of the seed coat and shape of the seed in legumes**).
Züchter 1941 : **13** : 73–77.

Since instances of parallel variation may be of value in many ways as an aid in the interpretation of biological phenomena recorded in the study of plants, the author has assembled in one paper some of the examples of such variation, observed by him or other workers, in legumes (including *Pisum* sp., *Vicia Faba*, *Phaseolus* sp., soya beans, lentils and *Astragalus cicer*).

1138. SCHREIBER, F. 635.652:575.11.061.63
Die Genetik der Teilfärbung der Bohnensamen (*Phaseolus vulgaris*).
[**The genetics of partial coloration of bean seeds (*P. vulgaris*)**].
Z. indukt. Abstamm.-u. VererbLehre 1940 : **78** : 59–114.

The colour-limiting factor *L*, investigated by the author in 1934, is dominant to the factors producing partial coloration, and its effect in crosses involving factors producing more extensive coloration is studied in this paper.

The variety Wachs Rheinland, synon. Goldelfe, of which the seed is almost entirely coloured, having only small spots of white, was crossed with Wachs Konservanda, a variety from the cross Wachs Beste von Allen x Konserva. In the F_1 coloration was limited to the region

round the hilum. In the F_2 the variation was so great that it was impossible to determine the Mendelian segregation but in the F_3 seven phenotypes are distinguished and described. These are named as follows:—expansa, restricta, erasa, marginata, laciniata, ambigua and intermedia. Of these, expansa, restricta and marginata breed true and are most probably homozygous. Erasa segregates partly into the restricta type and may be either homozygous or heterozygous with complete dominance over restricta in the latter case.
The three doubtful types, laciniata, ambigua and intermedia are studied more closely. Laciniata is found to be an intermediate form between the types marginata and erasa. There is incomplete dominance in the cross marginata x erasa. About a half of the F_2 of the ambigua beans of the cross Rheinland x Wachs Konservanda, showed the segregation 1 expansa : 2 ambigua : 1 restricta and the other half segregated into 1 expansa : 2 ambigua : 1 marginata. Further crosses showed ambigua to be an intermediate form between expansa and restricta as well as between expansa and marginata.
The intermedia type gives in the F_2 all variations as in the original cross of Wachs Rheinland (expansa) x Wachs Konservanda (erasa). The same results were obtained in the cross marginata x restricta as in expansa x erasa, the F_1 being the intermediate form.
Further crosses showed that there are two free, Mendelizing, interacting genes in homozygous and heterozygous forms which are both present in the double recessive form in the restricta type.
Taking the symbols *T* for total coloration with the recessive *t* giving a partial coloration; *P* the basal factor for pigmentation and *p* the albinotic form; *Zz* a factor pair for the greater and smaller distribution of the zone of coloration and *Ll* the factor pair for limitation of the colour zone, details are given of crosses involving various combinations and segregation ratios.
No indication was found of the presence of the factor *E* suggested by Emerson (cf. also "Plant Breeding Abstracts", Vol. XI, 594).

R. M. I.

1139. Lamprecht, H. 635.652:575.127.2:575.11:581.162.5
Die Artgrenze zwischen *Phaseolus vulgaris* L. und *multiflorus* Lam. (**The species boundary between *P. vulgaris* L. and *multiflorus* Lam.**).
Hereditas, Lund 1941 : **27** : 51–175.

A certain amount of the material in this paper has been previously published (see "Plant Breeding Abstracts", Vol. XI, Abst. 595). In the present paper more genetical results obtained from a study of the F_3 to F_{11} generations of the cross *P. vulgaris* x *P. multiflorus* are given. The position of the cotyledons is due to two genes, *Hyp* and *Epi*. The shape of the stigma is also controlled by two genes, *Ext* and *Int*. Flower colour segregations were rather complex, the two species differing in at least eight genes. There were also found at least two genes for direction of inflorescence, two for internode lengths and two for number of internodes in the inflorescence. Segregations for shape, size and hairiness of leaves, for plant habit and for seed size were also studied. Completely sterile and more or less narrow leafed plants (the *angustifolia* type) are probably caused by a chromosome deficiency, the *angustifolia* type being homozygous for the small deficiency. Crosses between *multigaris* (see "Plant Breeding Abstracts", Vol. XI, Abst. 595) and *vulgaris* were also studied.

1140. Dermen, H. 635.652:576.356.5:577.17
Intranuclear polyploidy in bean induced by naphthalene-acetic acid.
J. Hered. 1941 : **32** : 133–38.

Polyploid cells were found in the non-meristematic parts of the tumours induced on the stems of beans (*Phaseolus*) by the application of naphthalene acetic acid in lanolin paste. The types of chromosomes found at metaphase (diplo-chromosomes) indicated that repeated divisions of the chromosomes had occurred in the resting stage, without separation at the centromeres and it is asserted that this was induced artificially.

1141. Magruder, R. and Wester, R. E. 635.653:581.48:575.242.061.6
Green cotyledon, a new character in the mature lima bean (*Phaseolus Lunatus* L.).
Proc. Amer. Soc. Hort. Sci. 1941 : **38** : 581–84.

A green seeded lima bean of the Henderson type recently introduced into the American seed

trade has green cotyledons and resembles Henderson Bush in all other respects except the colour of the mature pods.
The white cotyledon colour of the ordinary lima beans when mature is dominant over the green colour of the new type and 3:1 ratios are obtained in F_2. It is probable that the new type arose as a mutation.
The new character is considered by the author to be of doubtful commercial value since it does not help in the production of a uniform sample for canning or freezing. The green colour is not well maintained after weathering in the field or after cooking. It causes no difference in ascorbic acid content.

1142. LAMPRECHT, H. 635.656:575.24
Über Genlabilität bei Pisum. (**On gene lability in *Pisum***).
Züchter 1941 : **13** : 97–105.

Stubbe's terminology with regard to the expression gene lability (Genlabilität) is criticized and the writer's own definition—mutation frequency—is discussed with suggestions as to the proper interpretation of the findings of Correns and Lilienfeld bearing on the process of gradual change in a particular gene.
The genes *Pur*, *V* and *Gl* in *Pisum* (cf. "Plant Breeding Abstracts", Vol. VIII, Absts 291 and 1659) were used by the writer in a genetical study of the general problem of frequency of mutation of genes.
The *Pur-pur*$_a$ *-pur*$_b$*-pur* series of allelomorphs mutated in the recessive direction and in conjunction with considerable phenotypic variation condition the phenomenon of gradual continuous mutation.
The *v-V* mutation mutated in the direction *v*⟶*V* and the *Gl* gene in the direction *Gl*⟶*gl*. Both *Pur* and *V* showed very great variation in the frequency of mutation. The conflicting results obtained by Winge, Lock, Tschermak and Fruhwirth are now explicable in the light of the present study. The gene *V* showed a mutation frequency of 0·1–1% in *PPvv* lines, but in material obtained by crossing (i.e. heterozygous to a certain degree) the frequency might be up to 20%. *Gl* had a mutation frequency of either 0 or about 0·1% and its mutation appears to depend on the heterozygosity of other genes in the same chromosome.
In addition to the influence of the genes with which these particular mutating genes are associated, one must also allow for the possible influence of the plasmatype as a factor affecting the manifestation of the genotype and hence affecting the mutation frequency. Mutations of the type above discussed might conceivably represent processes tending to remedy a disturbance in the balance between the plasmatype and the genes in question.

1143. 635.656–2.111–1.521.6:575
WADE, B. L. 635.656–2.484–1.521.6:575
Frost tolerance of strains of market garden peas.
Proc. Amer. Soc. Hort. Sci. 1941 : **38** : 530–34.

In plots of breeding strains and commercial varieties of peas at Charleston, South Carolina observations were taken on frost damage occurring in February, 1939 (seed sown in mid-January) and in November, 1939 (seed sown in September). Significant differences were observed and they were sufficiently consistent in the two series to indicate that carefully controlled conditions for the evaluation of frost tolerance would be justified.
Notes are also given on the resistance to wilt (*Fusarium orthoceras* Appl. and Wr. var. *pisi* Linford) of certain of the lines, this being the main objective of the breeding work.

1144. NOLL, W. 635.656–2.4–1.521.6
Über weitere Befallsymptome und Massnahmen zur Verhütung von Schäden durch *Ascochyta pinodella* Jones, *A. pisi* Lib. und *Mycosphaerella pinodes* (Berk. u. Blox.) Stone bei Erbsen. [**On further symptoms of attack and measures for preventing injury by *A. pinodella* Jones, *A. pisi* Lib. and *M. pinodes* (Berk. u. Blox.) Stone in peas**].
Z. PflKrankh. 1940 : **50** : 49–71.

The need for growing varieties of *Pisum sativum* resistant to foot rot and wilt diseases is exemplified by reference to American research and experiments made in Germany to test the resistance of 24 varieties of peas (*P. sativum* and *P. arvense*) to *A. pinodella* are described. No relation could be found between degree of attack and differences in the stage of development of

the plants at the time of infection. Schorr's Rappoldshofer Viktoria, Delikatess, Peragis (a field pea), Wunder von Witham [Witham Wonder] and Svalöf's Buttererbse [Butter pea] were some of the most resistant, but whether they would be also resistant to samples of *A. pinodella* from other regions remains to be seen.
No completely resistant varieties have yet been found.

1145. Mogilev, L. M. and
Rjakhovskii, N. A. 635.656–2.482–1.521.6
(Selection of pure lines resistant to *Ascochyta* from the pea variety Heine's Viktoria).
Naučnye Zapiski Sakharnoi Promyšlennosti (Sci. Trans. Sug. Ind.) 1939 : No. 1 : 124–27.

Observations were made on 500 pure lines of the pea variety Heine's Viktoria in respect of reaction to *A. pisi* Libert when grown in an artificially infected plot. The lines showed differences in reaction, 0·8% of them giving a low degree of infection, 62·4% intermediate and 36·8% a high degree. Lines 53, 161, 363 and 405 showed especially marked resistance; in other respects they were identical, both morphologically and biologically, with the other representatives of the variety. In consequence of their resistance they are superior and more uniform in yield.

BOOK REVIEWS

FISHER, R. A. 519.24

Statistical theory of estimation.

Calcutta Readership Lectures, 1938 : Pp. 44.

This Booklet contains a series of lectures given to the Statistical Conference at Calcutta in 1938. It is based on the author's own publications during the years when he developed his theory of estimation. This theory is concerned with achieving maximum precision in the estimation of what are called parameters. For example we may wish to estimate the value of the recombination fraction from observed frequencies with which the phenotypes have occurred, or we may have to estimate the nitrogen contents of barley corn in a field from that in samples analysed, or we may wish to calculate the parameters in Mitscherlich's law of diminishing returns from the observed response of yields to the application of manure at increasing levels.

It is shown how the method of estimation varies in accordance with the statistical distribution law which the observed data follow. If this law is known the theory provides a means of estimating where possible the parameter sought with maximum precision (calculation of "sufficient statistic"). In cases where a "sufficient statistic" can not be found the theory yields the loss in precision which arises through using a less "efficient statistic" for the estimation.

In this booklet the author confines himself to giving the general theory which is developed in masterly briefness and conciseness. It is assumed however that the reader is acquainted with certain results of advanced calculus. Details of the application of the theory to particular cases are to be found in numerous papers by the author and others. H. O. H.

MCLEAN, R. C. and
COOK, W. R. IVIMEY 578.08

Plant science formulae. A reference book for plant science laboratories (including bacteriology).

MacMillan and Co., Ltd., London 1941 : 7s. 6d. Pp. vi + 203.

This book should prove invaluable to every botanical worker; it contains, ready to hand, formulae for practically every process normally used in the laboratory. It would certainly have saved the reviewer many hours of search in half-remembered sources for some elusive formula.

The range of material is very wide; perhaps most important to the cytogeneticist and breeder are the sections on fixatives, stains and other aspects of microscopic technique, the preparation of museum specimens, chemical and microchemical reagents, solutions for volumetric analysis and photographic reagents. In addition there are formulae for the preparation of culture and nutrient solutions and solid media and a very useful and varied list of formulae for use in the workshop, tables of chemical and physical contents, a table of logarithms, a list of scientific suppliers and many other useful pieces of information.

The subject matter of the book is, on the whole, admirably chosen. While the reviewer has not checked large numbers of the formulae, perusal of familiar ones gave the impression that the proof reading had been very carefully done. Two mistakes were noted in the section on viscosities (p. 163). In the section on photographic reagents, it would probably have been more useful to give formulae for modern fine-grain developers of the paraphenylinediamine type than to include the now rarely-used pyro-soda and a formula for physical development; but for the first edition of a book of this type remarkably few such criticisms can be made. S.E.

LAWRENCE, A. S. C. 578.08:77

The scientific photographer.

Cambridge University Press, London 1941: 18s. Pp. x + 180. 83 figs.

This book is a treatment of the scientific principles of photography in general, and its usefulness is not therefore limited to the scientist. There is, however, a treatment of the more specialized types of photography in the concluding chapter, where the particular techniques used by the archaeologist, astronomer, physicist, metallurgist, biologist and others are reviewed, though not in great detail.

The outlook throughout is clear and up-to-date, and the procedures and principles outlined have little of the mysticism which was so common in earlier photographic textbooks.

Emulsions, lenses, types of camera, colour photography, the procedure in taking photographs and dark-room technique are dealt with in turn and the fundamental principles of each clearly expounded, without unnecessary attention to "detailed instructions of the sort included with materials when bought." So far as the book goes it is admirable, but it seems unduly condensed for a book published at such a high price. The discussion of lenses, for instance, deals adequately with the various types of aberration (though Figure 22 is a little too aberrant!), but there is no detailed description of the various types of lens at present on the market and of their respective merits and failings. The discussion of camera types is also too condensed, and would not help the scientific worker appreciably in choosing apparatus. Furthermore, no mention at all is made of the various types of enlarger commercially available.

S. E.

TRANSEAU, E. N.,
SAMPSON, H. C. and 58
TIFFANY, L. H. 575
Textbook of botany.
Harper and Brothers, London 1940: $4.00. Pp. xi + 812. 424 figs. 4 pls.

This new textbook of botany has several attractive features, the most obvious being the production of the book, which is printed in a clear and pleasant type, well bound and provided with ample and very good illustrations. In the more important matter of the text we find a refreshing concentration on the dynamic aspects of the subject and on experiment and observation. The book is in fact designed to supplement practical work. This, combined with the attention paid to the relation of plants to man and the insistence on scientific methods of thought, justifies the publishers' adjective "modern".

All aspects of botany are covered in the 53 chapters and there are references for further reading.

In future editions the authors would do well to revise the chapters on heredity. For example, the only instance of linkage given is one of complete linkage and the intelligent reader, applying the principles stressed throughout the book, could pertinently ask how it is to be known that two genes are concerned and not one, without getting any satisfactory answer. Later, on p. 481, we find crossing-over confused with translocation and segmental interchange as an "irregularity". In view of this error it is not surprising to find the obsolete distinction of the first division of meiosis as the "reduction division" perpetuated (not to say perpetrated) on p. 450. The elimination of blemishes of this type, which one would resignedly accept as inevitable in the average botany textbook, will make this book an outstanding contribution to botanical literature.

SCHISCHKIN, B. K. and
JUZEPCZUK, S. V. (Editors) 581.9(47)
(Flora of the U.S.S.R. Volume X).
Edited by the Scientific Academy of the U.S.S.R. Leningrad 1941. 27 roubles. Pp. xxiii + 673. 38 figs.

Continuing the series already reviewed (cf. "Plant Breeding Abstracts", Vol. X, p. 152), this volume deals with the Rosoideae and Prunoideae and includes economically important genera such as *Rubus, Fragaria, Amygdalus, Persica, Armeniaca, Prunus, Cerasus*, etc., as well as the complicated genera *Alchemilla, Potentilla* and *Rosa*. The genera *Padus, Cerasus* and *Amygdalus* have been entirely revised.

The addenda include Latin diagnoses of new species mentioned in the main text.

It is hoped that the flora of recent territorial acquisitions may be dealt with in the next volume.

With Volume X (representing about half of the number of volumes planned for the whole work), 6,971 species have now been described.

BALD, C. 633.73(54 + 54.8)
Indian tea. A textbook on the culture and manufacture of tea.
W. Thacker and Co., London 1940: Rs.15. 5th ed. Pp. xvi + 471. 19 figs. 44 illus.

This textbook, which is primarily intended for planters, deals with both the culture and manufacture of Indian tea. The range of subjects covered in the twenty-five chapters is

very large. Thus among the chapter headings are pruning, manuring, roads, forestry, plucking of tea leaf, withering, sorting and packing, buildings, machinery and tea garden labour and houses. Chapter VIII has the title, "Tea seed and tea nurseries", and includes short accounts of the history of the introduction of tea into Assam, of tea breeding and of seed gardens. Very considerable revision and in places complete rewriting of the original text have been made in bringing this fifth edition up to date, but the editor states in the preface that he has tried as far as possible to maintain the original style and format which have in the past contributed in no small measure to the success of the book and to its value as a source of ready reference on most matters connected with the culture of tea.

FORD, C. E. 633.912:581.165.1(54.8)

The identification of Ceylon clones of *Hevea Braziliensis*.

Rubb. Res. Scheme, Ceylon: Pp. 32. Illus.

The object of this manual is to enable Estate Superintendents to check the identity of buddings of Ceylon clones. The first part of the manual consists of a general analysis of clone characteristics based on notes given in "The History and Description of Clones of *Hevea Braziliensis*" and "Identificatiekenmerken van de Voornaamste in de Practijk Aangeplante *Hevea*-Cloonen" (Cf. "Plant Breeding Abstracts," Vol. XI, p. 144), published by the Rubber Research Institute of Malaya and the Centrale Proefstations-vereeniging, Netherlands East Indies, respectively. The following 6 clones are then described—Hillcroft (HC.) 28 and HC. 55, Millakande (MK.) 1/1 and MK. 3/2, Wagga (WG.) 6278 and Wawulugala (W.) 259. Descriptions are given of buddings with from 3 to 6 storeys (i.e. from 6-15 months old) and there are also short notes on the mature trees. In addition to the descriptions there are given for each clone three full page plates—the first plate being a diagrammatic representation of a 10 year old tree, the second a photograph of a leaf and the third a photograph of a budding with from 3 to 6 storeys. Descriptions of further clones will be issued from time to time as loose sheets which can be fitted into the present binder.

INDEX

Aamodt, O. S., 1008
Adair, C. R., 1006
Afzal, M., 875
Ahmad, N., 873–4
Åkerman, Å., 962
Al'benskii, see Albensky
Albensky, A. V., 1116
Alekseeva, M. V., 1126
Alexeeva, see Alekseeva
Andrés, J. M., 906
[Anghel, G.], 899
Anonymous, 867–8, 870, 876, 881, 884, 886, 888, 896, 898–9, 908, 1013, 1060, 1068–9, 1077, 1114, 1122
Ansari, M. A. A., 866
Arima, S., 1057
Arnason, T. J., 863
Atwood, S. S., 1015
Aust, S., 964, 969
Ayyangar, G. N. Rangaswami, see Rangaswami Ayyangar, G. N.

Bailey, D. M., 1136
Bailey, L. H., 1094
Bain, H. F., 1107
Bald, C., p. 335
Bald, J. G., 862
Barducci, T. Boza, see Boza Barducci, T.
Barker, H. D., 891
Bartels, K., 1038
Becker, 994
Bel'govskii, see Belgovsky
Belgovsky, M. L., 904
Beregovaja, M. M., 1049
Berkner, 998
Bettoney, S., 894
Bigger, J. H., 986
Billeau, A., [898], 1110
Black, W., 864
Blake, M. A., 1079, 1083
Blanchard, R. A., 986
Blandin, J. J., 1066
Bojarskii, Ja. J., see Boyarsky, J.
Booberg, G., 1044
Borisenko, S. F., 966
Bose, R. C., 850
Botez, I., [898], 1072
Boyarsky, J., 1050
Boza Barducci, T., 1034
Brandes, E. W., 1041, 1043, 1065
Breslavets, see Breslavez
Breslavez, L. P., 917
Briggs, F. N., 997
Brink, R. A., 1054
Britten, E. J., 941
Brittingham, W. H., 1007
Brown, H. D., 1127
Burgess, I. M., 1131
[Burlănescu, C.], 899
Butler, L., 887

[Cameron, G. S.], 867
Campbell, J. A., 1120
[Câmpineanu, D.], 899
Camp, M. Lange-de la, see Lange-de la Camp, M.
[Căpriță, S.], 899
[Ceapoiu, N.], 899
Chapman, W. H., 992, 996
Chase, S. B., 1090
Chilton, S. J. P., 1009
Christiansen-Weniger, F., 947
Clark, J. A., 958
Clark, J. H., 1102
Cochran, W. G., 892
Collins, D. L., 1115
[Constantinescu, G.], 898–9
Constantinescu-Ismail, G., 1108
Cook, W. R. Ivimey, p. 334
Cooper, D. C., 1054
Cormany, C. E., 1045
Cosmo, I., 1081
[Crăciun, E.], 899
Crist, J. W., 893
Currence, T. M., 1123
Curtis, L. C., 1128
Cutler, G. H., 950

Darrow, G. M., 1093, 1104
De la Camp, M. Lange-, see Lange-de la Camp, M.
Dermen, H., 1082, 1107, 1140
Dodonova, E. V., 920
Doi, Y., 1002–4
[Ducker, H. C.], 867
Duis, W. H., 1100
Duka, S. Kh., 1105
[Dumitrescu, C.], 898
Dvorjankin, F., 903

Edmundson, W. C., 1023
Eggebrecht, H., 1048
Eifrig, H., 946
Emden, J. H., 1058
Emre, E., 947
Engelbert, V., 859
Engelke, H., 927
Esteva, C. (jun.), 1051

Fagerlind, F., 916
Farrior, J. W., 1091
[Fielding, W. L.], 867
Fischer, G. W., 923
Fischer, H. E., 1093
Fisher, R. A., p. 334
Flory, W. S. (jun.), 1076
Ford, C. E., p. 336
Foulon, L. A., 1020
Friend, W. H., 1088
Fröier, K., 930, 962
Frost, H. B., 1087

Gaal, L., 972
Garrison, C. S., 984
Gates, R. R., 911
Gattenberger, P., 1031
Gavrilov, G., 1027
Geddes, W. F., 935
Geitler, L., 915
Gelin, O. E. V., 990
Gerbaldi, C., 1080
Giles, W. F., 1041
Gorčakov, A., 1037
Govande, G. K., 871
Greenleaf, W. H., 1053
Guerra, A., 1112
Gulati, A. N., 874
Gustafson, F. G., 919
Gustafsson, Å., 989, 991

H. . . ., F. S., 921
Hackbarth, J., 1016–7
Hamilton, D. G., 856
Harrington, J. B., 855
Harrison, A. L., 1135
Hartman, V., 1121
Harvey, P. H., 975
Haupt, A. W., 1118
Hawkes, J. G., 865
Hayes, H. K., 983, 987
Hearne, J. F., 880
Heggeness, O. A., 1063
Heyn, A. N. J., 1039
Higgins, B. B., 1092
Hildreth, A. C., 1106
Hoener, I. R., 982
Hoffman, J. C., 1127
Holton, C. S., 923–4
Howard, H. W., 865
[Hoyle, S. T.], 867
Hume, A. N., 980
[Hutchinson, J. B.], 867
Huziwara, T., 1004

Immer, F. R., 995
Inoue, T., 1057
Inozemtsev, A., 1030
Ionescu, M. V., 972, 981
[Ionită, M.], 899
Isbell, C. L., 902
Ivanov, N. N., 920
Ivanovskaya, E. V., 1022
Iyer, P. V. Krishna, see Krishna Iyer, P. V.
Izumi, S., 1002

Jablokov, A. S., 1113
Jaggar, I. C., 1124
[Jameson, J. D.], 867
Jensen, H., 1119
Johnson, I. J., 1014
Jokihaara, J., 959
Jones, E. T., 961
Jones, J. W., 1000
Juzepčuk, see Juzepczuk
Juzepczuk, S. V., (Editor), p. 335

Kadam, B. S., 889
Karper, R. E., 999, 1011
Kausche, G. A., 907
Kawamura, E., 1005
Kendall, M. G., 848
Khačaturov, S. P., 965
Khodkov, L. E., 993
Kihara, H., 945
Kirpichnikov, V. S., 904
Kirpičnikov, see Kirpichnikov
[Kiselev, D. A.], 896
Kishen, K., 850
Kline, L. V., 1090
Knapp, A. W., 880
Koblet, R., 936
Köhler, E., 1025
Kondo, Y., 1002
Koshal, R. S., 874
Kostjučenko, I. A., 953
Kotwal, J. P., 861
Kravčenko, Ju. S., 929
Kravchenko, J. M., 993
Kravchenko, Ju. S., see Kravčenko, Ju. S.
Krishna Iyer, P. V., 851
Kruft, F., 1074
Kružilin, A. S., 909
Kühl, O., 932, 934
Kulebjaev, V., 1028, 1033
Kunhi Koran Nambiar, A., 858
Kuzmin, A. J., 1109
Kuz'min, A. Ja., see Kuzmin, A. J.
Kuznetsov, A. V., 951
Kvasnikov, B. B., 1125

Lammerts, W. E., 1073
Lamm, R., 1021
Lamprecht, H., 1139, 1142
Lange-de la Camp, M., 922
Lantz, H. L., 1084
Lawrence, A. S. C., p. 334
Lesley, J. W., 1133
Lesley, M. M., 1133
Levan, A., 1010, 1119
Levčenko, L. P., 900
Lock, G. W., 877
Longley, A. E., 977–8, 1000
Ludwig, W., 912
Lynes, F. F., 1045

McClintock, B., 979
[Macdonald, D.], 867
[McKinstry, A. H.], 867
McLean, R. C., p. 334
Macrae, N. A., 879
Madoo, R. M., 1034
Magruder, R., 1141
Makarovskii, A. F., 944
Maney, T. J., 1084
[Manning, H. L.], 867
Marani, M., 1080
Mattson, H., 1129
Mel'ničenko, Ja. S., 940
Meyer, A., 1132
Middelburg, H. A., 1018
Middleton, G. K., 992, 996, 1091
Miller, J. C., 1026
[Miller, W. L.], 867
Mitkov, T., 967
Mittmann-Maier, G., 1078
Modilevskii, Ja. S., see Modilewski, J.
Modilewski, J., 1052
Mogilev, L. M., 1145
Molotkovski, G. Ch., 976
Molotkovskii, G. Kh., see Molotkovski, G. Ch.
Moore, J. H., 1035
[Moşneagă, V.], 899
Müntzing, A., 968
Murav'ev, P. A., 957
Myers, W. M., 1009

Nair, K. R., 852
Nambiar, A. Kunhi Koran, see Kunhi Koran Nambiar, A.
Nash, L. B., 1024
Newcomer, E. H., 1101, 1134
Neyman, J., 849
Nieves, R., 938
Nilsson, F., 1099
Nilsson, H., 1040
Noll, W., 1144
[Nye, G. W.], 867

O'Connell, T., 853
Odland, M. L., 1061
[Oescu, C.], 898
Ossent, H. P., 964
Otani, Y., 1003–4
Owen, W. M., 1124

Papadakis, J. S., 890
Parker, R. N., 885
Parrott, P. J., 1067
Patankar, V. K., 889
Patel, S. M., 889
Pavlov, B. Ja., 973
Peacock, N. D., 1132
[Peat, J. E.], 867
Pehl, P., 970
Pepper, B. B., 984
[Perepeliuc, C.], 898
Petrenko, A. G., 1055
Petrov, A. V., 1103
Pilin, G. M., 1097
Pokhil', I. F., 931
Ponnaiya, B. W. X., 860
Ponomarenko, F. A., 952
Poole, C. F., 985
Popescu, O. G., 972
Popescu, Ş., [898], 933
Popravko, A. V., 905
Porter, A. M., 1061
Powers, L., 1106
Prakken, R., 968
[Prentice, A. N.], 867
Prezent, I., 910, 1126
[Priadcenco, A.], 899
Prokof'eva-Bel'govskaja, see Prokofyeva-Belgovskaya
Prokofyeva-Belgovskaya, A. A., 904
Pukhal'skii, A. V., 928

Quinby, J. R., 1011
Quisenberry, K. S., 949

Rangaswami Ayyangar, G. N., 858, 860
Regel, C., 1062
Richardson, A. L., 1123
Richharia, R. H., 861
Rinke, E. H., 1014
Rjakhovskiĭ, N. A., 1145
Roberts, E., 982
[Rose, M. F.], 867
Ruggles Gates, R., see Gates, R. R.
[Ruston, D. F.], 867
[Rževskii, I. S.], 896

S....i, 1098
S...., S. O., 878
Saboe, L. C., 983
Saks, A. L., 954
Salter, R. M., 901
Sampson, H. C., p. 335
Sandu-Ville, C., 925
Sârbu, N., 932, 934
[Săulescu, N.], 899
Săvulescu, T., 925
Schischkin, B. K., (Editor), p. 335
Schreiber, F., 1138
Schröck, O., 1019
Schwanitz, F., 1046
Scott, R. C., 857
[Šekhurdin, A. P.], 896
[Serbănescu, N.], 899
[Šestakov, V. E.], 896
Sethi, B. L., 869
Shiga, N., 1001
Silow, R. A., [867], 872
Simon, E. G., 1042
Sinskaya, E. N., 1012
Skinner, H. T., 1117
Slate, G. L., 1095
Slușanschi, H., 972, 981
Snelling, R. O., 986
Sokol'skaja, B. P., see Sokolskaja, V.P.
Sokolskaja, V. P., 1086
Soliterman, P. V., 897
Srinivasan, B., 854
Stanford, E. H., 956, 997
Stanton, T. R., 960, 963
[Stephens, S. G.], 867
Straub, J., 918
Stringfield, G. H., 974
Stuart, N. W., 1071
Stubbe, H., 907
Suematsu, S., 914
[Surridge, H. R.], 867

Taggart, W. G., 1041–2
Tatarintsev, A. S., 1070
Taunay, A. de E., 1059
Tavčar, A., 971
Tennberg, F., 959
Teodorescu, I. C., [899], 1111
Terao, H., 1002–4
Tharp, W. H., 891
Thompson, W. P., 941
Tiffany, L. H., p. 335
Tingey, D. C., 963
Tinney, F. W., 1008
Tokhtuev, A. V., 988
Tolmačev, I. A., 1096
Transeau, E. N., p. 335
Tregubenko, M. Ja., 940
Troll, H.-J., 1017
Tschermak-Seysenegg, E. von, 1137
Tsinda, K., 1029
Tuneu, R., 1112
Tyo, Z., 1004
Tzitzin, N. V., 942–3

Uselman, J. J., 1124

Vajić, B., 948
Vallega, J., 926
Veli-Zade, I., 1036
Vendrikh, Ju. V., 1047
Verma, P. M., 875
Vinogradova, E. I., 939
Vorob'eva, N. F., 1064

Wada, E., 937
Wade, B. L., 1143
Wadleigh, C. H., 891
Waldo, G. F., 1093
Ware, J. O., 1032
Webster, C. C., 882–3
Weeks, W. D., 1075
Weibel, R. O., 949
Weiss, M. G., 895
Welch, D. S., 1115
Wellensiek, S. J., 1056
[Wells, W. G.], 867
Wester, R. E., 1141
Whitaker, T. W., 1124
Woodward, R. W., 963
Worzella, W. W., 950

Yamaha, G., 913
Yarnell, S. H., 1088
Young, P. A., 1130

Zablouda, G. V., 955
Zabluda, see Zablouda
Zimmerman, G. A., 1089
Zorin, F. M., 1085

THE IMPERIAL BUREAU OF PLANT BREEDING AND GENETICS,
School of Agriculture, Cambridge, England.

Director : PROF. F. L. ENGLEDOW, M.A., Drapers' Professor of Agriculture.

Deputy Director : P. S. HUDSON, Ph.D.

Assistants :

MISS M. L. C. WILSON, B.A. — J. L. FYFE, M.Sc. (Temporary) — H. W. HOWARD, Ph.D. (Temporary)

Secretary : MISS V. K. WATSON (Acting).

Publications:

PLANT BREEDING ABSTRACTS.

Issued quarterly. Subscription 25/-, with Subject Index 27/6. (Subscriptions sent direct from within the British Commonwealth of Nations are subject to a reduction of 5/-). Single copies 7/6 each. Drafts should be made out in sterling currency.

A few back numbers are obtainable at 35/- per volume, single numbers 10/- each.

Copies of "Plant Breeding Abstracts" printed on one side of the paper can be supplied, for the convenience of readers wishing to cut up and file the references, at an additional cost of 5/- per volume.

Important Note.—Every effort is made to make Plant Breeding Abstracts as complete as possible and its notices of papers referring to plant breeding or the genetics of crop plants as prompt as possible. To aid in this, authors are invited to send to the Deputy Director copies of their papers immediately on publication.

Other Publications :

SUPPLEMENTS TO PLANT BREEDING ABSTRACTS	s.	d.
Summary of Reports received from Countries exclusive of the British Empire, 1928-31. Supplement I.	2	6
Summary of Reports received from Stations in the British Empire, 1932-35. Supplement II.	2	6

TECHNICAL COMMUNICATIONS	s.	d.
Vernalization and Phasic Development of Plants	10	0
An Outline of Cytological Technique for Plant Breeders	1	6
The South American Potatoes and their Breeding Value	3	6
The Action and Use of Colchicine in the Production of Polyploid Plants, by J. L. Fyfe	1	0
Field Trials: their Lay-out and Statistical Analysis by John Wishart	2	6
Joint Publication No. 3. The Breeding of Herbage Plants in Scandinavia and Finland	4	0
Potato Collecting Expeditions in Mexico and South America, by J. G. Hawkes	3	0
New and Promising Varieties recently described in the Literature	1	0

INDEXES	s.	d.
Subject Index to Vols I to V of Plant Breeding Abstracts	2	6
Subject Index to Vols VI to VIII of Plant Breeding Abstracts	2	6
Subject Index to Vol IX of Plant Breeding Abstracts	2	6
Subject Index to Vol X of Plant Breeding Abstracts	2	6

BIBLIOGRAPHICAL MONOGRAPHS	s.	d.
Breeding Varieties Resistant to Disease	2	0
Breeding Resistant Varieties, 1930-33 (Supplement)	2	0
Oat Breeding Bibliography	1	6
Rice Breeding Bibliography	1	6
Bibliography on Interspecific and Intergeneric Hybridization in Relation to Plant Breeding	2	0
Account of Research in Progress in the British Empire	3	6
Rye Breeding Bibliography	1	6
Bibliography on Breeding Sorghums and Millets	1	0
The Experimental Production of Haploids and Polyploids	2	6
Tobacco Breeding Bibliography	1	0
Bibliography of Baking Quality Tests, Supplement	1	6
Bibliography on Cold Resistance	1	6

Subscriptions to any of the above Publications should be sent to Imperial Agricultural Bureaux, Central Sales Branch, Agricultural Research Building, Penglais, Aberystwyth, Wales.

Loss in Transit.—Claims for numbers of Plant Breeding Abstracts lost in transit will only be considered if notice of such loss is received within three months of the date of posting.

IMPERIAL AGRICULTURAL BUREAUX

IMPERIAL BUREAU OF PLANT BREEDING AND GENETICS,

School of Agriculture,

Cambridge, England,

covers current literature on the breeding, genetics, and cytology of economic plants, including forage crops, fruits, and forest trees, and relevant publications in allied fields, such as applied statistics, plant pathology and other sciences.

For publications see inside cover.

IMPERIAL BUREAU OF PASTURES AND FORAGE CROPS,

Aberystwyth, Great Britain,

covers current literature on grassland and forage crop research, the botanical aspect of soil conservation and certain plant biological research.

Publications: Herbage Abstracts, 25/- per annum,* 7/- per quarter.

Herbage Reviews, 15/- per annum, 4/- per quarter. (Discontinued at the end of 1940 until further notice).

IMPERIAL BUREAU OF HORTICULTURE AND PLANTATION CROPS,

East Malling, Kent, England,

covers current literature on horticulture, including fruit, vegetables, commercial flower production, the cultivation of tropical plantation crops and the storage and processing of horticultural products.

Publication: Horticultural Abstracts, 25/- per volume,* single copies 6/6.

IMPERIAL FORESTRY BUREAU,

39, Museum Road,

Oxford, England,

covers current literature on all branches of forestry and issues a quarterly publication.

Publication: Forestry Abstracts, 25/- per annum,* single copies 7/6.

IMPERIAL BUREAU OF SOIL SCIENCE,

Rothamsted Experimental Station,

Harpenden, Herts.,

covers current literature on soil science, and issues an abstracting journal six times yearly.

Publication: Soils and Fertilizers, 25/- per annum.*

* These prices are subject to a reduction of 5/- per volume to subscribers within the British Commonwealth sending their subscriptions direct to the Imperial Agricultural Bureaux, Central Sales Branch, Agricultural Research Building, Penglais, Aberystwyth, Wales. Certain Bureaux publish special editions of their abstracts journals printed on one side of the paper only, for use in card indexes.

PRINTED BY W. HEFFER & SONS LTD., CAMBRIDGE, ENGLAND